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THE LOFTY BUILDINGS OF NEW YORK CITY.

Were it possible for its first settlers to revisit Manhattan Island in these closing years of the nineteenth century, they would find that a transformation had been wrought which, to their wondering eyes, would appear truly magical. The fisherman who was wont to make his landing from the Hudson River at what is now Greenwich Street, or from the East River at Pearl Street, would find that the land had encroached upon the water to such an extent that the area of the triangular lower end of the island had grown to well nigh double its former proportions, a continuous belt of land, from 400 to 700 feet wide, having been reclaimed from the water and covered, like the original soil, with the towering buildings of a great metropolis.

We have already, in a recent issue, shown how great has been the increase in the area of this section of Manhattan Island as the result of the extension of its bulkhead lines far beyond the natural boundaries of the river. In the present article we shall show how the capacity of the same district to provide for the vast business interests which center within it is being further increased by carrying its buildings up to unprecedented heights above the street level.

It is safe to say that there is no

(Continued on page 285.)

Brooklyn Bridge. Court House. World Building. Sun Building. Tribune Building. American Tract Building. Times Building.

VIEW OF THE CITY HALL AND THE NEWSPAPER BUILDINGS ON PRINTING HOUSE SQUARE.

World, 294 ft. Surety, 312 ft. Trinity Church, 285 ft. Park Row, 386 ft. Tract Society, 290 ft. St. Paul, 307 ft. Sun, 70 ft. Capitol, 287½ ft.

THE TALL BUILDING PROBLEM IN NEW YORK.

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NEW YORK, SATURDAY, OCTOBER 10, 1896.

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LABOR AND MACHINERY.

It is an old cry, and one that has frequently been raised during the present century of industrial development, that improved machinery is the hostile competitor of the workingman. With the introduction of each new labor-saving device it was freely predicted that capital would be enriched, labor impoverished. It was so with the cotton gin and the loom; with the locomotive and the reaper; with the sewing machine and the typesetter. In each case the prophets were false prophets; not because they loved lying, but for lack of knowledge. Their outlook was too narrow. They mistook the little circle which included their own particular interests for the broad area of the industrial world at large.

When the weavers complained that the loom, by enabling one man to do the work of many, would throw a multitude out of employment, they did not foresee that the reduced cost of the product would multiply the demand for it so rapidly that the call for labor would increase tenfold.

When Stephenson demonstrated that freight and passengers could be hauled by locomotives over iron rails, the stage, driver, the 'ostler and the innkeeper grew riotous, and declared that the bread was being taken out of their mouths. Yet to-day in the United States alone the railroad gives employment to nearly a million men, and by the stimulus which its transportation facilities have given to industry it is the indirect cause of the employment of ten millions more.

Elias Howe with his sewing machine in a public competition beat five of the swiftest sewing hands in a factory, and at once the cry went up that the new device would throw thousands of tailors out of employment. Instead of so doing, it made such a reduction in the cost of sewed goods that the increased demand called into existence an army of workmen and workwomen greater than ever existed in the days when sewing was done by hand.

It seems like the repetition of a mere truism to state that the cheapening of manufactured products by the invention of improved machinery has brought fifty men into employment for every one that it has thrown out; but there are some truisms which will bear, and which demand, occasional reiteration. We have noticed during the past few weeks that there is a tendency among the public speakers who are instructing the people in matters pertaining to industrial economy to attribute the present depression, at least so far as it concerns the great army of the unemployed, to the introduction of labor-saving machinery.

It does not come within our province, nor have we any intention of entering into a discussion of the political question of the hour; but when we see the ghost of this former bugbear resurrected from its proper oblivion and shaken in the face of our intelligent artisan classes of to-day, we feel that our duty as a journal devoted to the interests of the industrial arts calls for the utterance of a strong word of protest and emphatic denial. To raise again the cry that "machinery is displacing labor," as was done by a noted public speaker in a recent address, is to appeal to those unreasoning impulses which once caused a mob of cotton spinners to break into the house where Mr. Whitney was conducting his early experiments and wreck his half completed cotton gin. Of course, "machinery is displacing labor;" this is exactly what it was intended to do; but for one toiler that it displaces it brings in ten, nay, a hundred others, who are doing the work better, with less fatigue, in shorter hours and for an average wage which is greater in itself and far greater in the amount of food, shelter and clothing which it can buy than in any other period of the world's history.

The same speaker is correct when he says: "The introduction of machinery has marked a complete revolution in methods of production and in prices. The improved machines have worked wonders, have upset the calculations of the wisest, and their introduction has worked a total change in commerce, trade and transportation." But he is guilty of the most transparent sophistry when he attempts to show that the electric motor, for instance, is reducing the number of employed in the land, by quoting the case of a certain city, where "the street car companies introduced electricity on their lines" with the result that "two hundred and nine skilled mechanics, who had been engaged in shoeing the horses, laid their hammers down, quenched the fires in their forges, and walked out on the street to begin life anew." In the case of those discharged shoeing smiths, and others who may be in a similar predicament, "machinery displaced labor," it is true; but what about that vast army of workmen which owes its existence to the invention of the electric motor, and finds profitable employment in its manufacture, operation, and repair?

We grant that in the case of those two hundred men the introduction of electricity worked a hardship which calls for universal sympathy; but, judged from the standpoint of humanity at large, weighed in the balances against that principle which seeks always "the greatest good of the greatest number," the loss of work by these men, deplorable as it was, is merely an accident in the onward progress of an invention which is bringing, and will continue to bring, work, good wage, and a host of the conveniences of life to millions of the human race.

Whatever local or temporary hardship the introduction of improved machinery may work, its ultimate effect is to vastly enlarge the fields of labor, continually opening new avenues of employment. For one class of work that it supersedes it creates a dozen others. It may be said that indirectly the inventor is the greatest of all employers of labor. It is to the joint co-operation of invention, capital and labor in the past that we owe the existence of those vast industries which have carried our country forward to its present proud position in the world of manufacture and commerce.

The interests of machinery and labor are so identical that it may be said without exaggeration that the vast improvement in the condition of the working classes which has taken place in the past half century is directly due to the progress of mechanical invention. Cheap food and clothing, improved dwellings, cheap literature, the penny paper, workmen's trains, enabling the laborer to live amid the refreshing surroundings of a suburban home, are a few among the blessings which have resulted directly or indirectly from the fostering of invention and the introduction of improved machinery. It is inevitable, as we have seen, that, in the readjustment of labor which follows the introduction of improved methods, some few individuals must occasionally suffer; but the compensation for the temporary suffering of the few is found in the permanently bettered condition of the vast majority.

Just now the country has fallen into the trough of that phenomenal wave of prosperity which passed over it from 1886 to 1892. The cause of the present depression lies very deep; too deep to be touched by any mere legislative act. It is to be found in certain immutable laws of supply and demand which operate (as we are now finding out) as resistlessly in the new world as they have done in the old. But whether the scarcity of employment be due to the scarcity of the demand for the product of labor or not, it may be written down once and forever that it is not now due, never was due, and never will be, to those triumphs of the inventor's mechanical skill the record of which forms one of the proudest chapters in the history of the United States.

The Canal Lock at Bremerhaven.

The new imperial harbor of Bremerhaven will soon be opened to the public, and a work will then have been completed which must be counted among the most important of its kind. The new harbor has been in course of construction since 1892. It will be protected from all sides by very strong levees against the frequent high flood tides of the North Sea, and will contain three large basins, which will be open during ordinary high tides, while at ebb tide the entire complex of basins and passages will be closed off by gigantic locks. Since the dimensions of steamships are continually growing, and the largest steamers of the North German Lloyd must be able to enter the new harbor, the entry had to be made large enough for all. The former inner harbor at this point was greatly increased in size, and a new entrance was built, which comprises, besides a strongly built dike over three-quarters of a mile long, the largest lock so far constructed. This lock will be kept closed whenever the water in the Weser River is lower than the depth of water to be maintained in the harbor. When open, the lock has a clear width of 91 feet, the gate being 38 feet high, the largest in the world. The length of the lock between the two gates is 700 feet, and at ordinary high tide there is a depth of water of 33 feet. The gates rest in two masonry structures built on caissons of 20 feet in height and solidly cemented to the ground. The building of these structures, which took place under very favorable conditions, has succeeded surprisingly well, considering that it is one of the most difficult technical problems. The entire construction rests upon pile work, the length of the piles varying from 50 to 70 feet. Most of the construction work was carried on during the ebb tide, recurring twice every twenty-four hours, so that only four hours a day could be employed at that work, and that only in favorable weather. What an immense amount of work was necessary to construct this harbor is evident from the following figures: Twenty thousand piles were sunk for a foundation, 45,000,000 cubic feet of soil had to be taken away on dry ground, and as much more dredged out by the immense dredges formerly used in the construction of the North Sea-Baltic Canal. At the entrance of the harbor 4,750,000 cubic feet of masonry were necessary to strengthen the dikes and hold the colossal locks. An immense dry dock has been built immediately adjoining the harbor, which will accommodate the largest vessels of the world, its dimensions being identical with that of the lock at the entrance of the harbor.—St. Louis Globe-Democrat.

AN International Exhibition of Gardening will be held at Hamburg, Germany, beginning next May. The exhibition will be kept open until September. It will comprise all branches of gardening and the cultivation of plants.

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The Return of Lieut. Peary.

The steamer Hope, with Lieut. Peary and party, arrived at Sidney, Cape Breton, on September 26. In spite of the stormy summer season and a large amount of ice in Greenland waters, Mr. Peary and his party have returned with a good record of scientific work and with very large collections, although he was unable to secure the big meteorite of Melville Bay, which was one of the objects of the trip. After leaving Turnavik, Labrador, the Hope steamed north along the coast, encountering great quantities of heavy ice. The party obtained three polar bears, two of which were brought home securely tied in a large cage on the deck of the vessel. The Hope entered Hudson Strait and reached Ashe Inlet, on the north side, on July 25. After a call at a village of Hudson Bay Eskimos, the Hope forced a passage through the ice, rounded Resolution Island on July 29, and on July 30 attempted to enter Cumberland Sound, but was prevented by heavy ice. The vessel then made for Godhavn, Disco Island, Greenland, which was reached on August 2. Here magnetic observations were made. Calls were then made at Atanikerdluk, Omanak, Upernavik, Wilcox Head, and Melville Bay. At all these places various members of the party were landed to enable them to pursue their special lines of investigation. Melville Bay was crossed in twenty-six hours, and Cape York was reached on August 8. Here Lieut. Peary found that the few natives had been decimated by influenza and that his second house (Anniversary Lodge) in Northwest Greenland had been burned by the carelessness of an Eskimo witch. The eclipse of the sun was observed about midnight on August 30. The lower limb was obscured to an amount equal to one-fifth of the entire disk. The Hope then steamed northward, visiting various settlements, obtaining important casts, photographs and measurements, and gaining important additions to the collections. Heavy ice, which filled Smith Sound, prevented the steamer from reaching Cape Sabine.

The site of Polaris House, where a portion of the Hall expedition wintered, also Port Foulke, Dr. Hayes' winter quarters, was visited. On the return trip, Cape York was reached on August 23, and, though a landing was made, it was found impossible to remove the great meteorite with the hydraulic jacks, and the ice compelled them to retreat on September 4. Wilcox Head was reached on September 7, and Prof. Tarr and his party were embarked. Calls were then made at the other places where members of the expedition had been left to make studies or collections. The Niantilik whaling station was reached on September 17, and, after making magnetic and pendulum observations, collections, etc., this place was left on September 19, and the voyage to Sidney was made in seven days. The explorers found that last winter was exceptionally severe in Greenland.

The collections which will find a home in the American Museum of Natural History filled one hundred packing cases. The Cornell party under Prof. Tarr made interesting studies on a large double glacier, which they called Cornell glacier.

A pleasant surprise awaited Mr. Peary on his return home. Some time ago it was suggested by the Philadelphia Geographical Club that the great interior of North Greenland, which the sledging parties which he has led have alone explored, should bear his name. This suggestion was highly approved by foreign geographers, and hereafter the interior of North Greenland will be known as "Peary Land." This name will be most conspicuous on the map, owing to the size of the territory embraced, as he has explored a larger area of Greenland than has fallen to the lot of any other explorer. The land which Mr. Peary saw north of Greenland, and which is separated from it by a channel, is the most northern land known. The Fram drifted for many months in more northerly latitudes without seeing a particle of land. This channel has been named Peary Channel by Prof. Guido Cora, of Turin.

Geographers who believe that the great problem of the discovery of the pole may be attacked by following a coast line to the north will now probably advocate the Greenland route, as De Long, Nansen and Jackson have proved that the eastern part of the polar area has no coast line to be followed.

Mr. Astor's New Electric Launch.

John Jacob Astor's handsome new electric launch Utopian went off the ways from Ayer's ship yard, Upper Nyack, on September 10. The launch was not a perfect one, as the draw chain broke and left the bow on the ways, but after an hour's work she was floated all right.

The Utopian is one of three electric launches owned by Mr. Astor. Her cost will be from $18,000 to $20,000. She is a twin screw auxiliary launch, 72 feet over all, 12 feet beam, 3 feet 6 inches draught, and was designed by Charles D. Mosher. The motive power is electricity, and the boat will be driven by two 25 horse power motors, built by the Rick Electric Motor Company. She will also have auxiliary sail power. Mr. A. W. Johnson, electrical engineer, will have charge of all the batteries and the machinery in general. Mr. Astor will usually run the launch himself.

The boat will have a search light of from 1,000 to 10,000 candle power, and be lighted throughout by electricity. She was built to make sixteen miles an hour. Her first trip will be to Fern Cliff, at Rhinecliff, where the batteries will be placed at Mr. Astor's boat house, built for his electric launches.

The Sixty-fifth Exhibition of the American Institute.

The present exhibition of the American Institute, which was opened on Monday, September 28, is practically a revival of a series of famous annual exhibitions which were given continuously from 1828 to the year 1892. The American Institute of the City of New York, as it was called, was chartered with the avowed object:

"To encourage and promote domestic industry in this State and the United States in agriculture, commerce, manufactures and the arts, and any improvement made therein, by the bestowing of awards and other benefits on those who shall make such improvements or excel in any of said branches."

The first fair was held in 1828, in the old Masonic Hall on Broadway, near Pearl Street. Others took place in old Niblo's Garden from 1834 to 1845, at Castle Garden and the Battery, and at the Institute rooms in Cooper Union. In 1869 the Institute secured the Empire Skating Rink, on Third Avenue between Sixty-third and Sixty-fourth Streets, and from that year up to 1892 the fairs were held regularly in this building, which was widely known as the American Institute Hall.

In looking back over the records of the Institute one can say that they are a record of the growth of this country in the industrial arts and sciences. The subsequent fame and wealth which their inventions brought to the winners of the Institute's medals are proof of the discriminating judgment with which the awards were made. Among the early winners of medals were the sewing machine, the many-chambered cylinder rifles of Samuel Colt, and Richard M. Hoe's type revolving press. The first anthracite coal burning stove of Dr. Nott was first given notoriety by the American Institute. Morse made one of the earliest exhibitions of his telegraph at the Niblo's Garden Fair. The gold medal was awarded to the inventor of the stocking loom in the early days of its introduction, and the telephone was first shown to the public in the Third Avenue building. As far back as 1839 a gold medal was given to Joseph Francis for the invention of the lifeboat. Naval architecture, as was fitting in the chief seaport of the country, always received liberal encouragement, and in 1851 George Steers was given a gold medal for the model of his famous yacht America, which brought home the much contested cup from English waters.

It is thus that "the hopes of its projectors have been realized in its giving substantial aid in the development of the products of American industry. It is not a moneymaking institution, has no stockholders, is governed by its board of trustees, pays taxes on its property, has but a limited appropriation from the State as the Agricultural Society of the County of New York, and is accountable to the State for all it does, for all that it holds and owns."

The present reading rooms and library of the Institute are located in West Thirty-eighth Street. Here the various sections hold the regular meetings. They comprise the Farmers' Club, under the direction of the Committee on Agriculture; the Polytechnic, under the direction of the Committee on Manufacture and Machinery, which discusses scientific subjects and examinations of new inventions, etc., and is really the Mechanics' Club of the old days under a new name; the Photographical Section, under the direction of the Committee on Chemistry and Optics; and the Electrical Section, under the direction of the Committee on Electricity, are all part of the working of the American Institute, with their meetings held regularly, and the discussions open to every one interested in advancement and education.

From 1892, when the Third Avenue building was torn down, to the present year there has been no exhibition; but this year, through the efforts of Mr. Charles Chamberlain, Director of the Institute, it was decided to engage Madison Square Garden for all of October and "to take up the lines where they were dropped in 1892."

The miscellaneous part of the exhibit is housed on the main floor, and below, on the machinery floor, will be found the heavier machinery. On this floor is a very complete exhibit made under the auspices of the Paper Digest Company, showing the whole process of getting out a paper. It comprises first a Mergenthaler typesetting machine, then, in their order, a self-feeding printing press by the Whitelock Machine Company, driven by a two horse power electric motor direct connected to the driving shaft, a folding machine, a cutting machine, a wire stitcher, and lastly a mailing and self-addressing machine. On the main floor above there is in operation a rapid press for printing cards, tags, or envelopes which has a speed of from 5,000 to 12,000 an hour. It was built by the Harris Automatic Press Company, Niles, Ohio. One of the most complete exhibits is that of Watson & Stillman, on the machinery floor. It comprises a large assortment of hydraulic jacks, rail benders, crank pin presses, die sinking presses, punches and shears. Near by is a large collection of split friction clutch pulleys and couplings, shown by the Dodge Manufacturing Company. Owners of small launches will be interested in a small Vogel steam engine built by Charles Vogel, Fort Lee, N. J. It is entirely incased, only part of the main and valve shafts being visible. It contains three cylinders and one rotary valve, and weighs 240 pounds for 5 horse power. It measures 12 inches by 24 inches by 12 inches high. The Otto gas engine is represented by four horizontal and two vertical engines, the latter designed for marine work. They range from thirty-six horse power to four horse power and show the usual high finish of these machines.

Perhaps the most novel and interesting exhibit on this floor is that of the Montgomery fiber-saving cotton gin, which is shown in operation. It is claimed that the fault of the Whitney saw gin, one of which is shown alongside the new invention, is that the teeth of the saw, in separating the cotton from the seed, tear it to pieces, and spoil the quality of the fiber, taking out the twist. In the new machine the cotton is caught by a leather covered ginning roller, and drawn downward by two small rollers over a fixed edge, on which the seed is pressed out of the boll. This operation is effected without breaking the fiber of the cotton, which is considerably longer than that turned out of the old form of gin.

On the main floor will be found a compact exhibit by the Daimler Motor Company, which will repay a careful inspection. It includes gasoline, gas and kerosene motors, a four-seated horseless carriage of very handsome appearance, and a railroad inspection car. This has two seats, one in front for the inspectors, and a rear seat for the engineer. Beneath the rear seat is the box containing the motor, and on either side of the motor is a cylindrical tank for the gasoline and water. It can be driven from 7 to 15 miles an hour, a higher speed not being necessary in the work of inspection.

Near by is shown an ingenious application of electricity in the Empire selflighting oil lamp. Beneath the base of a parlor lamp are two small dry batteries, and the wires are carried up to a small platinum coil within and near the top edge of the circular wick. By pressing the button the lamp is lit without removing the shade.

The process of manufacturing a silk handkerchief may be seen in an R. T. Brooks silk loom, and a set of sewing machines can be seen at work on fur and sealskin sewing. They show the same excellent finish which characterizes the sewing machine in general. There are six machines in the exhibit, and they are known as Excelsior Nos. 1 and 2 and the Columbia robe machine for heavy fur sewing. Here is also the tail twisting or spinning machine, and the pique prix seam Brosser glove machine.

The bicycle industry is represented by but one make of machine, the Humber. The machines are fitted with the plunger brake, direct through the head, and are similar to the English machine of the same name, with the exception of the pedals and cranks, which are round instead of flat, and the sprocket.

The A. A. Griffing Iron Company have a fine show of Bundy sectional, tubular, hot water heaters, and Bundy oil and steam separators, together with a wide variety of radiators.

An excellent exhibit is made by the H. W. Johns Manufacturing Company, of New York. The varied uses to which that most useful substance, asbestos, has been put is here shown in an extremely interesting stand. There is asbestic wall plaster—soundproof, fireproof, and a regulator of temperature; asbestos pipe and boiler covering; fireproof roof covering; electric asbestos pads for bed warming. Woven asbestos is shown made up into a complete fireman's suit, and the same fabric is worked up into gloves and boots for glass blowers, iron workers, and foundrymen, to protect them from heat and flying metal.

Photography is represented by Dana and Wurst, the latter showing some remarkable bass relief carbonettes, in which the lights and shadows of the photograph are accentuated by embossing or raising the figure.

No exhibition is complete in these days without its share of phonographic and similar displays, and the Columbia Phonograph Company shows in operation the graphophone, phantoscope, and kinetoscope.

The display of gas outfits for hotel and domestic use by William M. Crane & Company, of 838 Broadway, New York, is carefully prepared and elaborate. The Gas Engine and Power Company, of Morris Heights, New York City, show one of their well known twenty-five foot naphtha launches.

Suburban residents who are struggling with the problem of a lawn mower that won't mow should visit the stand of the Pastime Lawn Mower Company, where some most ingenious and practical improvements in these useful machines are embodied in a compact and novel mower.

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THE LOUISIANA SULPHUR WELLS.

BY PROF. J. B. FRAUCKHAUSER.

From your issue of December 21, 1895, the readers of the SCIENTIFIC AMERICAN have already gathered some information about the valuable sulphur mines of Southwestern Louisiana; hence the present article, giving a more detailed account of the manner in which the mineral is extracted from the bowels of the earth, will, I hope, prove of no little interest.

Since 1870 company after company failed in the attempt of establishing mines in Calcasieu Parish, La. The main difficulty to be overcome, which for the last thirty years has exercised the ingenuity of many an engineer, is the layer of quicksand, from four to five hundred feet in depth, covering the sulphur in question. The first company that grappled with this difficulty brought to the spot immense cylinders of steel, with the intention of sinking them to the required depth and using them as walls for the shafts. After considerable labor, an outlay of many thousands of dollars and even the loss of several lives, they abandoned the enterprise as practically impossible. The next company that was tempted to mine these same extensive veins of almost pure native sulphur put up immense refrigerators, and attempted, but to no avail, to "neutralize" the layer of quicksand by freezing it into one solid mass. After these and other attempts and subsequent failures it was clear that, if ever Louisiana was to place its sulphur on the world's markets, a completely novel method of mining it was to be invented.

The company now in charge bought some two years ago at Sulphur Mines and vicinity considerable tracts of land and began operations soon after. New failures were predicted until it became known that Mr. Herman Frasch, scientist and engineer, of Cleveland, Ohio, had entirely revolutionized sulphur mining by his new and ingenious process.

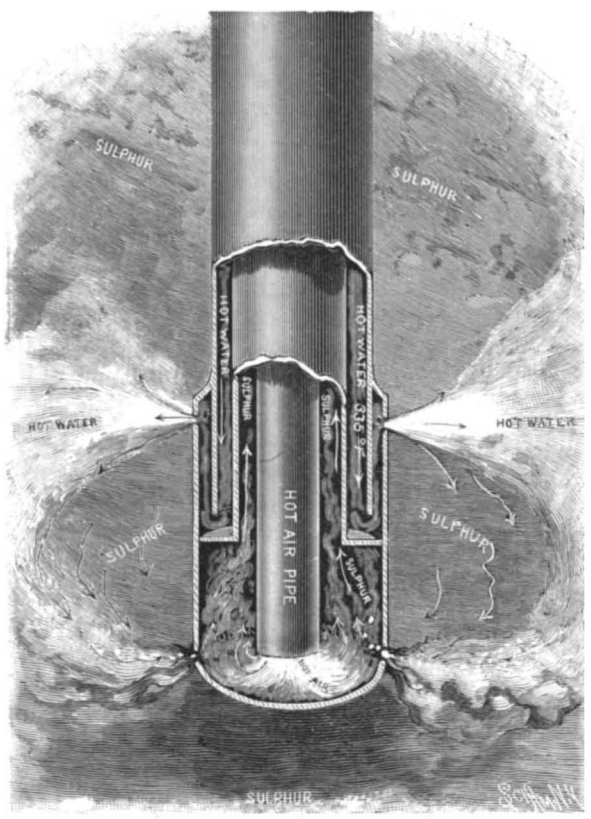
Everybody is acquainted with the method of mining salt in our Northern salt wells. Water is first pumped into the well, becomes saturated, and is then pumped up again. The salt is thence easily obtained. As sulphur is not soluble in water, the same process could not be used. Mr. Frasch, however, solved the difficulty by having recourse to heat. His process, similar in many particulars to the one just referred to, consists in melting the sulphur in its recesses and then pumping it up in a semiliquid state, leaving most of the impurities behind.

A well reaching down to the bed of sulphur and sufficiently large to receive a six inch pipe is first bored. The pipe used is in reality composed, as will appear from the adjoining cut, of three concentric pipes, which are respectively six, four and two inches in diameter. Through the cylindrical space left between the first and second pipes, water at the high temperature of 335° Fah. is poured into the earth. This water, as is evident, must be constantly kept under a pressure of from twelve to fifteen atmospheres; otherwise, it would be converted into steam and be useless.

After reaching the bottom of the pipe, which is closed, the water ascends and reaches a series of small apertures, placed all around the pipe at a distance of one inch from each other. The sulphur that lies concealed in a stratum of porous rock soon melts, as the hot water flows into the well; and since the pressure is very high, it is forced into the lower part of the pipe through a second series of holes as shown, collects in the cup, and is ultimately carried upward in the vacant space between the inner and middle pipes. The center pipe, which at first may seem to be unnecessary, had to be introduced to keep the sulphur from congealing before reaching the top of the well, and thus rendering all previous labor useless. Hot air, at a pressure always somewhat lower than that of the water in the outer pipe, is constantly furnished by immense heaters and introduced into the well through the inner pipe by a number of force pumps. The machinery once started, operations proceed until steam is blown off from the top of the pipe, in which case no more sulphur can be melted in the well, at least for the time being. A few hours later the work can be resumed. It sometimes happens that the steam is blown off after a very short time; at other times, however, several days elapse before this occurs. The pipe is occasionally sunk, as need may be, until the bottom of the sulphur vein is reached.

Such is, in short, Mr. Frasch's method. The sulphur thus obtained is, when it reaches the open air, of a dirty dark brown color. It flows into large shallow vats, is allowed to cool for eight or ten hours, crystallizes meanwhile, and is then sawed into blocks of convenient size.

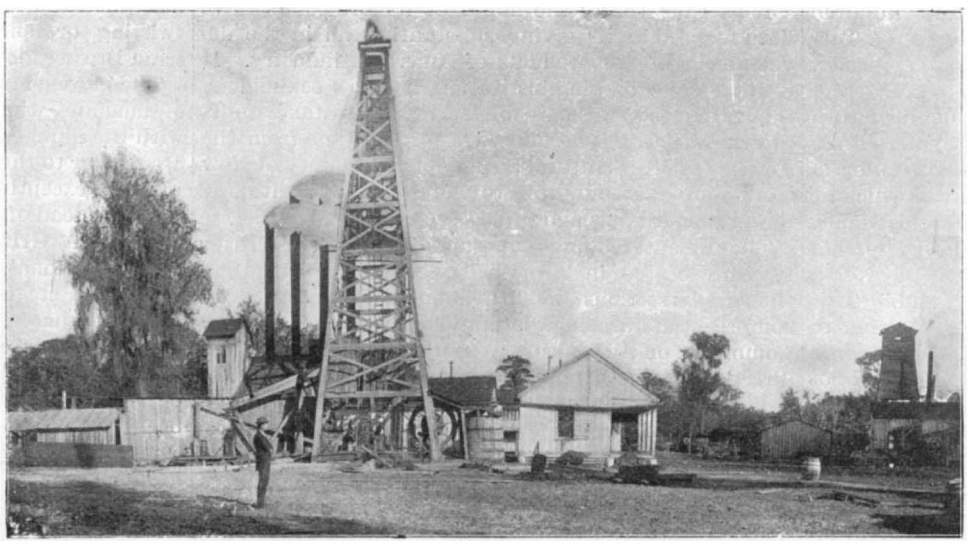
The first and main difficulty once overcome, a second one presented itself, namely, that of finding proper materials for the construction of the pipe. A metal not acted upon by sulphur, and still consistent enough to bear the strain of high pressures, was to be found. Iron or steel could not be used. Aluminum suggested



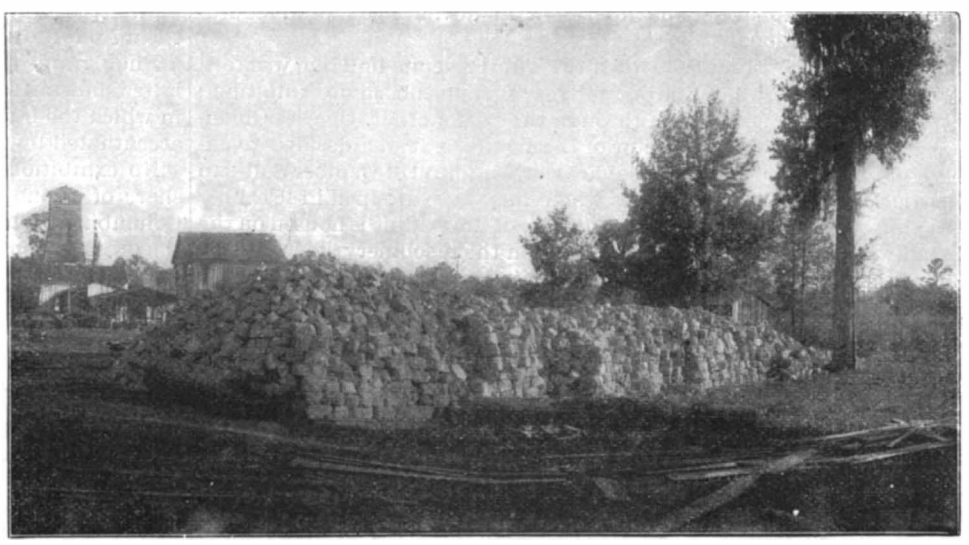
SECTION THROUGH INLET PIPE OF SULPHUR WELL.

itself from the start, but this metal is not strong enough to support the required pressure. A mean was struck by the inventor, and the steel pipes used were coated with a heavy layer of aluminum.

Thus equipped the present company is still proceeding cautiously, though sure of success. In a few months six or seven wells will be operating at the same time, and thousands of tons of the Louisiana mineral will be brought on the market to compete to advantage with the sulphur imported from Sicily and other countries. Analysis has proved the sulphur obtained from some of the wells to be ninety-nine per cent pure: a fact which strongly recommends this improved method of sulphur mining, and gives reason to expect that the extensive sulphur deposits of Louisiana will soon force from our markets the less valuable foreign product.



WELL, PUMP AND DRIVING MACHINERY—SULPHUR MINES.



SULPHUR BLOCKS READY FOR SHIPPING.

On the Plains of the Maremma.

The name of Maremma is given to a large extent of insalubrious land which borders the Mediterranean, whether insalubrious because uncultivated, or uncultivated because insalubrious, is a problem which has not yet been solved. Though both modern science and quickened national enterprise have of late years been applied to its solution, the results accomplished have been unconvincing. The Tuscan part of the Maremma stretches inland nearly to Siena. Beginning at the north a few miles from Leghorn, it extends to the ancient frontier of the Pontifical States, from whence the same immense tracts of sparsely cultivated and malarial territory continue under the name of the Roman Maremma and Campagna to the gates of Rome.

There is no hard-and-fast border line between the healthy and unhealthy land, but the transformation is a gradual one, the villages become rarer, the cultivated land diminishes, stretches of wood and bog are more frequent, until we no longer see any houses by the roadside, but only here and there in the distance some small gray hamlet perched on the top of a rocky hill, "like roosting falcon musing on the chase." On the hillside near such oases, some fields, a few olive trees, and then again begins the wood land, large forest trees, then groves of beeches and oaks, lopped continually for firewood, the forest full of dangers and alarm, with its ponds and bogs and labyrinths, a hiding place for anything from a ghost to a brigand, in short, the typical forest of the Maremma. Toward the Mediterranean coast the hills become less abrupt, and along the shore, and up the broader valleys which diverge from it, stretch immense extents of undulating grass lands seemingly uncultivated, but which really are sown piece by piece in regular rotation every ten years.

It is toward these plains that the migratory flocks gather to pass the winter, and here we may study a curious phase of life only possible in given circumstances of climate, of traditional customs, and of property. The large properties in the Maremma, consisting of pasture land and forest, have often a villa or castle for the accommodation of the proprietor on his flying visits, but always a factor's house which is the center of the administration for the buying and selling of the timber, the cattle, the lambs, and the cheese; the direct management of the flocks is, however, in the hands of the head man, or "Vergaio." From him the so-called "Vergheria" derives its name, the house, the center of business and of amusement, the general meeting place, the temporary hospital. It is a large loghouse constructed in the midst of the pasturage, usually on high lying ground, and if possible near a water course. Its shape is circular, the diameter being about sixty feet; it has a solid framework of logs lined with wattle work of canes and covered externally with thick thatch. This structure is completed by a conical roof surmounted by a cross (the apex being left open for the escape of smoke). Two doors of wattle and thatch give access to this cabin on the east and west. Two smaller doors in the interior lead on the north into a large shed in which the cheese is stored, and on the south into a smaller cabin inhabited by the "Vergaio." The wall spaces within the large circular cabin are divided by posts and planking into stalls, which are again divided transversely by two divisions so as to form so many box-like beds, the spaces between the lower horizontal planks and the floor being used as a wardrobe and store cupboard by the occupants of the respective beds, while from the dividing posts hang saddles, bridles, spurs, tassels, and decorations of every kind. In the center of the building a rude circle of stones is formed, in which a large wood fire burns. A stout pole, supporting a movable wooden arm at right angles, is planted by the fireplace; from the end of the arm hangs a chain and hook, by means of which the huge caldron for boiling the milk is suspended over the flame, or swung back to rest on the round cushion of withes on the hob. The same method is used with the pots in which the men cook their meals of polenta, etc.—Good Words.

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Buried in a Tree.

One of the most curious mausoleums in the world was discovered the other day in an orchard at the village of Noebdenitz, in Saxe-Altenburg. A gigantic oak tree, which a storm had robbed of its crown, was up for public auction. Among the bidders happened to be Baron von Thummel, scion of a family of ancient lineage that has given the world of literature one charming poet and the fatherland many distinguished statesmen. The Baron, who lives on a neighboring estate, had ridden to the auction place quite accidentally. Finally the tree was knocked down to him for 200 marks. Upon his arrival at the castle he told an old servant of his purchase, describing the tree and its situation. The old servant said he remembered attending the funeral of a Baron Thummel seventy or eighty years ago, and that the body had been buried in a thousand-year-old oak belonging to the parsonage. Investigation clearly proved that the orchard had once been the property of the village church, and that at one side of the old oak was an iron shutter, rusty and time-worn, that the people of the town had always supposed to have been placed there by some joker or mischievous boys. The iron shutter proved to be the gate to the mausoleum of Baron Hans Wilhelm von Thummel, at one time minister of the state of Saxe-Altenburg, who died in 1824, and wished to be buried "in the thousand-year-old tree he loved so well." In the hollow of the tree Baron Hans caused to be built a sepulcher of solid masonry, large enough to accommodate his coffin. The coffin was placed there, as the church records show, on March 3, 1824, and the opening was closed by an iron gate. In the course of time a wall of wood grew over the opening, which had been enlarged to admit the coffin and the workmen, and for many years it has been completely shut, thus removing the last vestige of the odd use to which the old tree had been put. The tree has still some life in it, and its rich verdure is only now turning a violet tint. The coffin in which Baron Hans reposes has on one side grown to the tree, the dead and the live wood joining together in eternal embrace.—Public Opinion.

The New Soo Lock.

At Sault Ste. Marie the new 800 foot lock was officially opened by the revenue cutter Andrew Johnson and the harbor improvement steamer Hancock locking through 10:30 A. M., August 3. Work on the lock was commenced on May 4, 1887, when the first dipperful of earth was excavated for the cofferdam.

Dimensions of the new lock are 800 feet long, 100 feet wide and 21 feet deep. The side walls are 1,100 feet long. From the east end for 282 feet the walls are 45 feet high, and from that point westward they are 43 feet high. The walls are 20 feet wide at the base and retain this width for 10 feet, when by five 2 foot offsets 5 feet apart they are narrowed to 10 feet in width. At either end the walls are 36 feet wide from base to top. The cut stone for facing is of the best Kelley Island limestone, and was transported here in the rough. The faces of the lock wall consist of 23 courses. From courses 2 to 22 the stones were cut 6 feet long, 3 feet wide and 2 feet thick, part of the first course and the capping course being 1½ feet thick. The cost to the United States for the masonry was $1,085,469. In the basement of the power house are situated two 30 horse power turbines, which will drive 3 three plunger single acting high pressure pumps that will deliver pressure fluid to loaded accumulators, where it will be stored under pressure of 300 to 500 pounds per square inch, ready for use, and delivered to engines as required. The exhaust, or discharge, from the engines will be returned by means of a separate set of piping to a tank in the engine room and used continuously. The pressure fluid will be a limpid mineral oil, and will be used during the entire season. This will be different from the present lock, which uses water pressure in the summer and oil during the cold weather. The lock chamber can be filled and emptied when in operation in from 6 to 7 minutes. Water is let in through six culverts, which run longitudinally under the lock floor. In connection with the lock, there is under construction a magnificent office and power building of cut stone and brick, which will be completed in December. It is 81 feet 6 inches long and 80 feet 9 inches wide, and will cost approximately $100,000. In the basement is located the operating machinery and pumping plant. Including the approaches, the great work completed will cost in the neighborhood of $5,000,000. The work was begun under the supervision of the late Col. O. M. Poe, who lived to see the great undertaking practically completed. General Superintendent E. S. Wheeler had active direction of the work.—Marine Review.

THE HOUTS AUTOMATIC TELEPHONE SYSTEM.

This system provides improved means for allowing any subscriber in a system to instantly connect himself with any other subscriber without the aid of an operator at the central office. Each telephone in the system is provided with a call box as shown in Fig. 1,

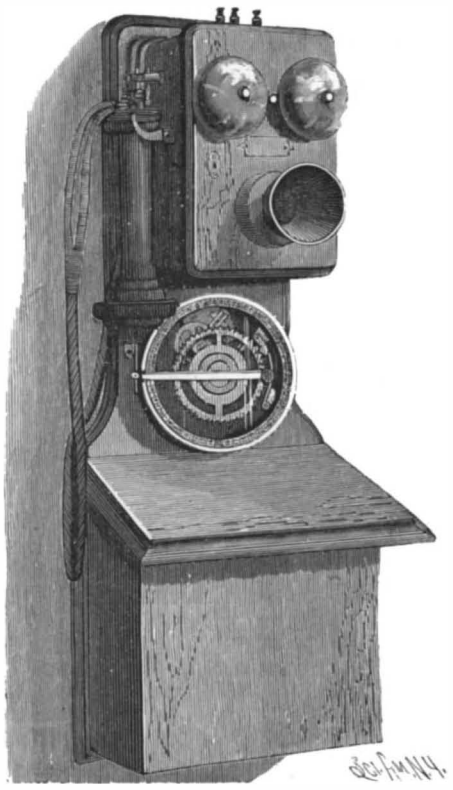

Fig. 1.—THE HOUTS TELEPHONE—AUTOMATIC CALL FOR SIXTY SUBSCRIBERS.

and at the central point where the wires come together a central appliance, as shown in Fig. 2, is so arranged that any call box in the system can instantly electrically connect the telephone to which it is attached to any other telephone in the system without interfering with any other telephone in the system or any conversation being carried on by any pair of telephones in the system. The improvement was patented by Wallace A. Houts and is being introduced by the Houts Automatic Telephone Switch Company, of Parker, S. D.

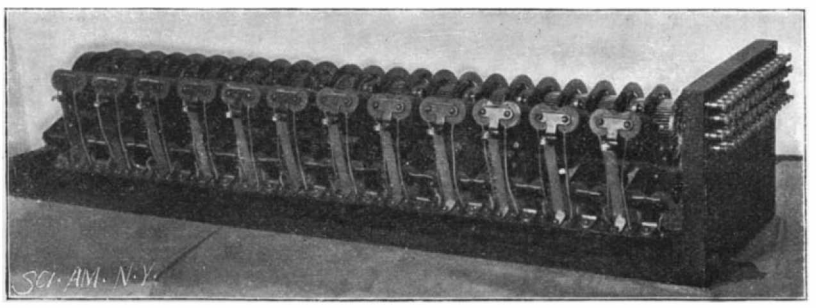

Fig. 3.—THE HOUTS TELEPHONE—SECTION OF CENTRAL OFFICE SWITCH.

The call box as shown in Fig. 1 is designed for sixty subscribers, while the central appliance in Fig. 2 has sixty wires, but only magnets and ratchet wheels enough for twenty-five subscribers.

In making a call the subscriber presses the handle on the face of the call box, moving the dial forward until the number with which he desires to communicate is opposite the button at the left. This button is pressed, which fixes the position of the dial, allowing the handle to turn on until it again reaches the home point or falls into the notch from which the subscriber has started it. This releases the spring-actuated toothed wheel (Fig. 1), allowing it to move forward until the proper number of electrical impulses have been sent over the wires to the central point and the leg attached to a ratchet wheel (better shown in Fig. 3) has been moved forward until it rests upon the wire attached to the telephone the subscriber wishes to call. The bell is then rung in the usual manner, notifying the subscriber that he is wanted. A rod connecting the receiver hook and the call box releases the dial as soon as the receiver is replaced upon the hook. This starts the call box, which sends the proper number of impulses through the magnets (better shown in Fig. 3) and turns the ratchet wheel (Fig. 3), so that the leg is returned to and rests on the home wire.

By bearing in mind that each call box in the system has a pair of magnets at the central point and a ratchet wheel which is insulated from all the other wires of the system, the working can be readily understood. The central appliance is built up in sections to accommodate the number of subscribers in the system, each telephone in the system having a wire running under each ratchet wheel in central, and insulated from all the wires and ratchet wheels of the system except its own.

This is the simplest system to which our attention has been called and would seem to be perfectly applicable in all systems of 100 or less, where the expense of an operator creates quite a tax upon a few subscribers. By the use of this system, perfect night, day and Sunday service can be had.

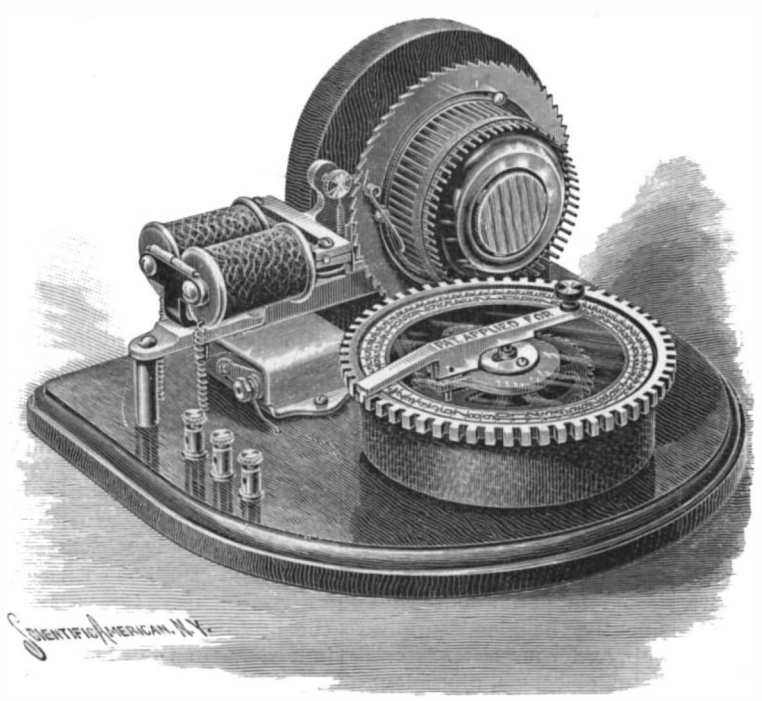

Fig. 2.—THE HOUTS TELEPHONE—CENTRAL OFFICE APPLIANCE.

Chemical Effects of the Sun's Rays.

The old text books used to tell us that the rays of the sun contain three things: light, heat, and actinism. We know now that these three things are one, or rather that the effects ascribed to them are different effects of one and the same radiation, which when it raises temperature is known as heat, when it affects the retina as light, and when it brings about chemical change as actinism. It remains a fact, however, that this last effect has been much less studied than either light or heat, except in some special and limited fields, such as that of photography. Some contributions toward a more exact knowledge of it are made by M. Duclaux, director of the Pasteur Institute at Paris, in the Annales of the Institute. We quote, says the Literary Digest, a notice from the British Medical Journal which runs as follows:

"The [chemical] activity of the rays was estimated by exposing solutions of oxalic acid of known strength to their action. The oxalic acid is converted with more or less rapidity into carbonic acid, which escapes, and at the end of the experiment the degree of acidity of the solution indicates the amount of the oxalic acid which has been decomposed, or 'burnt,' to use M. Duclaux's term. The results showed, as was to be expected, that with an overcast sky the chemical action of the sun's rays was much less than on a fine day, but beyond this they were far from concordant. With a dappled sky or with light cumulus clouds the solar combustion might be more active than with a blue sky or with a slight amount of cirrus. In a word, the apparent fineness of the day is not in any way related to its chemical activity and its hygienic power. On the whole, however, the action was greater in August than in September. This is in accordance with the experience of every photographer. As accounting partly for the discrepancies found between succeeding days both equally fine, M. Duclaux states that all essential oils and the odors sent forth into the air by vegetation diminish the actinic power of the radiations which reach the surface of the soil. A succession of warm days stimulating vegetation, and in mountainous regions increasing perhaps the amount of terebinthinate odors given out by the fir forests, will tend to render the air more impervious to, or more capable of absorbing, the actinic rays, so that on the third or fourth in a succession of fine days the chemical action of the sun's rays would be less than on the first. This difference under natural conditions would, however, be diminished by another observation made by M. Duclaux, to the effect that when in a liquid the chemical action set up by the sun's rays has once been started, it continues afterward more easily, so that when a partly overcast day follows a fine day the total action may be as great, or nearly as great, on the second as on the first day. M. Duclaux's researches certainly open up a wide field for research; they undoubtedly have a bearing on many hygienic questions, and we may echo his hope that his paper may stimulate others to prosecute similar inquiries."

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Cycle Notes.

Scorchers are dealt with severely in Vienna. A rider whose only offense was scorching was sentenced to a week's imprisonment, while two others who run down pedestrians, injuring them slightly, were imprisoned for one and three months and were also obliged to pay damages.

A lamp will light easier if the tip of the wick is squeezed free from oil between the fingers. In lighting a lamp in a wind, turn the side window away from the wind, and the moment the lighted match is inserted close the window until the flame from the match has lighted the wick.

The latest thing aboard ship is a bicycle race, says the Bicycle World. Instead of storing their wheels below, the enthusiastic young cyclers this season are hanging them on hooks in their respective staterooms, and in the dawn of early morning, before others are up, a spin around the deserted deck is almost as refreshing as a spin in the park in the morning. Lounges and camp chairs are shoved aside, everybody clears the way, and it is "one, two, three" and around and around, the motion of the vessel in an ordinary sea giving the most delightful sensation imaginable. A spin on terra firma is nothing to a spin on the ocean wave, as it were.

On the western slope of the United States there are long rainy terms, and to overcome this Mr. R. E. Dawdy, of Hoquim, Washington, has designed a silk covered frame which conforms to some extent to the outline of the person and strikes the rider about ten inches from the neck. This arrangement is fastened to the handle bar and looks not unlike a kite. It keeps the legs and feet dry in the hardest rains. Mr. Dawdy has a lever attachment to his bell which is arranged so that it can be easily rung by the knee on the downward stroke. He uses a wide celluloid mud guard and has his pedals covered with leather. All of the bright work is covered with vaseline. It is a great mistake for riders to put up their wheels at the beginning of winter. With proper arrangements, there should be no difficulty in riding at any time when snow and slush do not prevent.

In the June Bulletin of the Society of Civil Engineers of France an exhaustive account is given of some tests made to determine the efficiency of pneumatic tires contributing to the ease and comfort of a vehicle. With the usual French thoroughness, it describes the earliest pneumatic tires, and reprints descriptions of them published in 1846. The experiments were made with the pneumatic tire and the ordinary wheel, and there were five series in all. The first was made on three days, when the ground was covered with two inches of snow, when the same was melting, and when the ground was muddy. The results obtained showed that with the empty carriage moving at a walk through the snow the draught was 35·9 pounds with the iron wheel, and but 25·2 pounds with the pneumatic tire. At a trot, with a load of 660 pounds, the pull was 68·6 pounds and 39·5 pounds respectively. In the mud, under the same condition of load and speed, the pulls were 35·2 and 50·7 pounds for the iron wheel, and 23·1 and 31·2 pounds for the pneumatic tire. The other tests consisted of pulls of varying speeds over macadam, paved, and ordinary roads, and in every instance the pneumatic tire showed a saving in pulling power of from 30 to nearly 50 per cent. As to comfort, the well known silence of the pneumatic tire is enlarged upon; also careful measurements were made to show the difference in the vibrations caused by the two types of tires, and in this the advantages of the pneumatic tire were clearly shown. Its springy action is demonstrated by the fact that when it is made to pass over three obstacles there is a wavy motion given to the diagram, and that if two of the three are removed, the same wavy effect remains. Hence the elasticity of the pneumatic tire is proved by the rhythmic vibrations that it produces. But the main feature of interest in the matter lies in the fact that the actual amount of power required to pull a carriage equipped with pneumatic tires is very much less than it is when ordinary wheels are used.

A Beaver's Dam Settles Ownership.

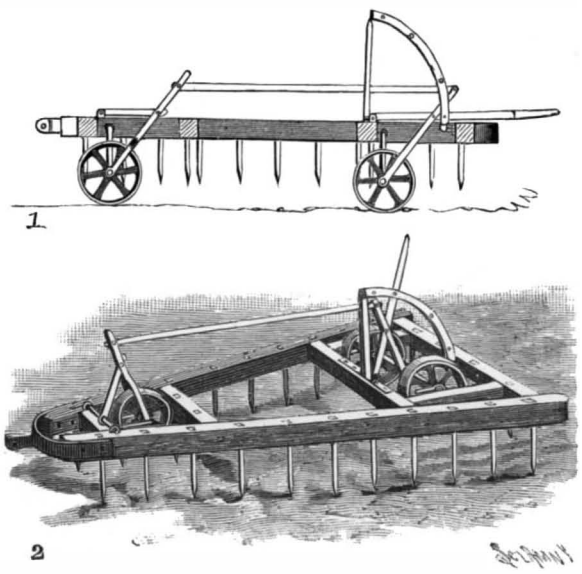
A very interesting suit has just been decided in the Court of Common Pleas of Huntingdon County, says the Philadelphia Press. About two years ago a Clearfield County surveyor, Thomas W. Moore, applied at the land office, in Harrisburg, for a warrant upon a tract of land in Carbon Township, that county, claiming that the land was vacant. The warrant being issued, the Rockhill Iron and Coal Company discovered that the tract was one of their most valued pieces of coal land, worth $40,000. They filed a caveat protesting against Moore's claim.

Upon trial of the case, Moore claimed that the land called for in the old warrant of 1786, on which the company based its title, was not on the tract in dispute, but somewhere else in the township.

The line trees having nearly all disappeared, the company would have had some trouble establishing its title had it not been that its old warrant of 1786 called for a beaver dam in Great Trough Creek and that the company had taken the precaution to send Prof. Wilcox, of Philadelphia, an expert on beavers and their habits, and two surveyors, down to search for the old dam. The professor and his assistants dug down into the bottom of the stream at the point where legend fixed its location. After taking out a couple of feet of wash and gravel, which had accumulated in the bed of the creek within the last century, they found the old dam made by the beavers during or prior to the revolutionary war. The cribbing sticks of the dam were found buried side by side in regular order, and the marks of the beavers' teeth were visible in the wood. These relics from the beaver dam, with Prof. Wilcox's testimony, turned the tide in favor of the Rockhill Company, and the jury had little trouble in agreeing upon a verdict in its favor.

AN IMPROVED HARROW.

The illustration represents a harrow whose wheels may be readily raised and lowered within the line of the teeth of the harrow, the teeth in operation entering the ground only as far as desired, or being raised entirely from the ground when an obstruction is met with, or where the harrow is to be moved from one place to another. The improvement has been patented by Herman W. Ferling and Emil Heim, of Little Rock, Ark. Fig. 1 is a longitudinal section of the harrow, showing the teeth elevated, and Fig. 2 represents it in perspective, with the wheels elevated. Journaled in the side bars near the front of the harrow is a crank axle on which is the forward single wheel, the two rear wheels being on a second crank axle journaled near the rear of the harrow frame, and both axles, in the portions between their arms, are pivotally connected by links or rods with a parallel link or rod extending from front to rear of the harrow. The forward pivotal rod is also connected by a link with a forward cross bar, and the



FERLING AND HEIM'S HARROW.

rear rod is pivotally connected with a lever movable in an arched, looplike guide, the lever being adjusted in any desired position by passing a pin through openings in the guide and registering openings in the lever. The depth to which the teeth are to be permitted to enter the ground is regulated by the adjustment of the lever, by which the crank portions of the axles are simultaneously raised or lowered. The harrow may be used with particular advantage on planted ground, as it can be adjusted to skim the crust and not injure the seed.

The Afternoon Nap.

The frequency with which medical men are asked whether it is harmful to indulge in the "afternoon nap" is not, perhaps, surprising, for several reasons. Most persons have had experience of the seductive charms of the somnolence which has followed the comfortable ingestion of a midday or evening meal. The meal finished, the diner arranges himself comfortably in an armchair; it may be he lights a pipe or cigar, takes up a newspaper, and prepares to make the most of the restful conditions of his mind and body. But nature soon begins to assert her sway. In time, the eyelids close, the head begins to nod, the newspaper falls from the hands, the pipe, no longer supported in the mouth, falls to the floor, and the symptoms of a nap are complete. Whether the "winks" be forty or one hundred in number, the result is the same—a short, sound sleep. Then comes the question—Is it harmful thus to fall asleep after a meal? By no means; for the very obvious reason that the process is merely a physiological one, and as such, when it occurs, is quite natural. When digestion is in progress, nature has arranged that all the available blood in the body shall be collected in and about the digestive organs. Consequently, the blood supply to the brain falls to a low ebb, and thus sleep is easily induced. On the other hand, of course, physiologically, it is wrong for brain work to be attempted immediately after a solid meal.—Medical Press.

Science Notes.

There will be a national exposition held at Turin in 1898.

At the Leyden International Zoological Congress, held last year, it was decided that the next meeting of the kind should take place in England, in September, 1898, and that Sir William Flower, director of the British Museum (natural history), should be its president. We now learn that it has been determined that the 1898 congress, the fourth of the series, shall meet at Cambridge under the auspices of the university, simultaneously with the International Physiological Congress, which has arranged to go there in that year.

M. Maurice Versepuy, the African explorer, is on his way back to France, having successfully accomplished a journey across Equatorial Africa. M. Versepuy set out from Zanzibar on July 3, 1895, accompanied by M. De Saint Romon and M. Spock, with a caravan of one hundred and fifty-one Ascaris. The chief landmarks of his journey to the Upper Congo were Kilimanjaro, Mount Kenia, Boringo, Mengo, and Uganda. The expedition on several occasions met with resistance from the natives. This is the seventeenth time Africa has been crossed in modern times.

Sparrows are possessed of queer traits, and are in the habit of building nests in strange places. One would scarcely believe that a sparrow would build a nest upon the gear underneath a railroad car that traveled many miles in a day, yet such a case was noted by the press not long ago. A newspaper reporter, not long ago, was standing upon a canal bridge, and saw attached to the rail running along the deck over the rudder a sparrow's nest. Almost every electric light contains a sparrow's nest, tucked away in the top of the shade and protected from the glare of the light by the framework of the lamp. The electric light tenders, who change the carbon points every morning, expect to find the nests, and never disturb them, and the sparrows seem not to mind the men at work.

Some six years ago M. Vallot erected on Mont Blanc, 1,400 feet from the summit, or 14,381 feet above sea level, the highest meteorological observatory in Europe. Having made twenty-one or more ascents of the mountain, and obtained observations during three successive summers, he now generously offers the use, not only of laboratory and instruments, but of kitchen and salon, to meteorologists of any nation who care to pursue their investigations amid such exalted surroundings. Intending visitors are advised to provide themselves with a somewhat substantial smelling bottle in the form of a steel tube filled with compressed oxygen, the approved remedy for mountain sickness being to inhale a few quarts of this enlivening element. Four Frenchmen, three Swiss, a German, an Italian, and an American have already availed themselves of M. Vallot's invitation, which is presumably for the summer months.

An interesting scientific experiment was made recently in Paris with the aid of a balloon which was sent up from Villette at half past ten, says the Westminster Gazette. The object of the experiment was to collect a quantity of the atmosphere at a very great altitude for purposes of analysis. The balloon was, therefore, sent up alone with the necessary instruments attached to it. These consisted of an entirely new kind of reservoir, capable of holding six liters of air. To this was attached a spiral arrangement terminating in a tap hermetically sealed, but so arranged with a clockwork apparatus that it would open just one hour after the ascent and close again one minute later. A good deal of ingenuity had been displayed in this invention. In order to preserve the reservoir from the intense cold of the upper regions, it was surrounded by a bath of soda water, which was expected to keep the apparatus at an even temperature. In addition, the balloon also carried two baro-thermographs for registration purposes at high altitudes. Attached to the balloon are instructions to those who may find it, so that it may be carefully wrapped up and forwarded to Paris forthwith.

Lamentations are arising from the Jardin des Plantes, Paris, and if they are not heeded, the decline and fall of the Zoological Gardens of Paris will soon become a matter of history. Valuable trees are dead or are dying from lack of attention. The monkey houses are in a bad way; the cages kept for the wild beasts which happen still to be in the land of the living leave much to be desired, from the point of view both of comfort and security; and the animals generally are throughout the twelve months strict observers of a sort of Lenten diet. Five years ago the last survivor of the rhinoceros species went over to the majority, and the poor beast's place has not since been filled. Lately there was a scare because the solitary hippopotamus, aged forty-one, betrayed symptoms of a break-up. The prospect of the gardens being left without a single representative of that kind of animal proved too much for the worthy director, M. Milne Edwards, who, with great difficulty, contrived to scrape together 10,000 francs, with which he purchased a juvenile member of the tribe, which is now on its road to the metropolis. Lack of funds, it scarcely need be added, is at the bottom of this melancholy collapse. The allowance granted by the government has been cut down, and there is every likelihood of its being further curtailed.

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Correspondence.

"The Largest Ship in the World."

To the Editor of the SCIENTIFIC AMERICAN:

In your issue of August 15 last, under the caption of "The Largest Ship in the World," you credit the vessel now building at the Vulcan shipyard, in Bredon, near Stettin, Germany, to the Hamburg-American line, whereas this steamer is being built for the North German Lloyd Steamship Company, of Bremen, Germany, for their service between Bremen, Southampton and New York.

In the interest of accuracy we would ask you to make the necessary correction in your next issue, and are, dear sir, yours very truly, OELRICHS & COMPANY.

New York City.

The Question of Stone Carving.

To the Editor of the SCIENTIFIC AMERICAN:

Under the heading of "Correspondence," in your issue of September 12, appeared an article entitled "Stone Carving: Where Should it be Done?" in which the writer presented clear and forcible reasons for believing that carving should not be executed on the banker, but on the stone after it is in place. Granting that the effect, considered from an artistic standpoint alone, is likely to be superior when the work is done on the placed stone, there are, nevertheless, it seems to me, good and sufficient reasons why carving at the quarry is to be preferred, especially if the finished design is to be subjected to the action of frost and rain. These reasons I shall now explain.

It is a well known fact that all stones are capable of absorbing considerable quantities of water. This is well shown in the following list, which indicates the percentage of water which may, under favorable circumstances, be absorbed by some of the common rocks of this country:

Granite	Beaver Bay, Minn.	0·71	per cent.
Marble	Dorset, Vt.	0·59	"
Gypsum	England	1·00	"
Limestone	Harrison County, Ind.	3·70	"
Sandstone	Jordan, Minn.	12·50	"

These figures indicate, as stated above, the amounts of water the rocks are capable of absorbing, but in nature, unless the rock is quarried from below the permanent water level, the amounts will be somewhat less. The water contained in the rock as it exists in the quarry (quarry water) usually, if not always, contains more or less mineral matter in solution. Now, if the quarried block is exposed to the atmosphere for any length of time, evaporation will take place on the exterior, the water from the interior will be drawn by capillarity to the surface and likewise evaporated, leaving the mineral matter which it contained as an extremely thin deposit which serves to bind together more firmly the superficial grains or crystals, the whole forming a surface more impervious to moisture and otherwise better able to withstand the action of the elements.

This crust, being once formed by the evaporation of the water, cannot, if destroyed, ever be reformed, and, therefore, if durability in a carving is desired, the work should be done at the quarry while the quarry water is still present. The crust would then form over the new surface, rendering it thereby much more durable.

If freshly quarried stone could be placed in its final position in a structure at once, and the carving done immediately, the objections mentioned would of course have no weight. Usually, however, months elapse between the time of quarrying and the placing of the stone, giving ample time for the formation of a crust. If the carving is now executed, the crust is destroyed and the prospect of the durability of the design greatly lessened. M. L. FULLER.

Brockton, Mass.

The Dangers of Cycling.

Cycling, which was yesterday the fad of the few, is today the pastime of the many; it has brought wealth to the wayside town and village, has given a new industry to the country, and, by taking the place of more expensive forms of locomotion, has facilitated in various ways the carrying on of trade. But, unfortunately, this progress which has taken place well within a quarter of a century has been attended with the sacrifice of many lives and with numberless casualties, many of which have been very severe. With the advent of the motor cycle it is more than probable that the number of casualties from cycling will increase, in which case legislation will be called for. We should, however, be sorry to see so popular a pastime as cycling trammeled by legislative rules, and hope that the good sense of cyclists will prevent anything of the kind, if the dangers are pointed out and the remedies which they can themselves apply are suggested.

It is a noteworthy fact that in nearly every case where an accident has occurred, the cyclist has been riding for pleasure, and it is still further noteworthy that by far the larger percentage of accidents are attributable to recklessness or want of knowledge and skill in manipulating the machine. A prolific source of accident and one which seems to present an ever-recurring source of temptation to many cyclists is to see how speedily they can sacrifice their lives in hilly ground. The moment the brow of a hill is reached the reckless cyclist seems impelled to take his feet from the pedals and to allow the machine to descend with all the rapidity which weight, gravity, and the gathering force give it. To the novice this is especially attractive, inasmuch as it gives him an opportunity of resting his tired muscles. Provided the rider has a straight and clear road, it is just possible that no accident may occur, but the story of casualties from this cause is invariably the same; the cyclist loses control over his machine and collides with some object, be it cart, hedge, or wall, with the resulting effect of death or severe injury. A good brake affixed to the back wheel of the machine would have the effect of considerably reducing the number of accidents from this cause; but, unfortunately, there is an idea that the addition of a brake adds an inconvenient weight to the machine. It is true that there is still room for improvement in the matter of brakes, but there is a pneumatic contrivance on the market which is both safe and effective. It being attached to the back wheel and being very light, the excuse of inconvenient weight cannot be urged. Another frequent cause of accident is the practice of "scorching." For the benefit of the uninitiated, we may define the term as an impulse overruling the cyclist's reason, compelling him to overtake any and every moving object which may be in front of him. It is somewhat analogous to the schoolboy's love of overtaking those walking before him, and it shows similar lack of mental control. Oblivious of everything but the one object of overtaking that which is immediately in front of him, he rushes madly on, and, if fortunate enough to escape injury to himself, is only too likely to cause serious harm, if not death, to the pedestrian who may be unfortunate enough to be in his way. The ambition for record breaking and the desire for making a "century run"—i. e., the covering of a hundred miles in one day—are greatly responsible for the practice of "scorching," and they should be strongly denounced by any medical man who has an opportunity of advising in the matter. These two causes of accident, which we are sorry to say cannot be attributed to the male sex alone, occur for the most part outside large towns, where reckless riding can be indulged in with some amount of impunity as far as the law is concerned. When we consider the accidents which occur in the busy towns, we have to chronicle carelessness, incompetence, and a lamentable want of knowledge as to the rules of the road. Quite a number of these accidents occur to women, many of whom are physically unfit to cope with the crowded traffic. Wedged in between a number of vehicles, and lacking the necessary nerve to extricate themselves, they waver, and either run into a horse and cause it to plunge or themselves fall beneath the wheels of a vehicle. The accidents which occur to the male sex may sometimes be attributable to the same cause, but more frequently they are the result of a reckless disregard of danger and a desire to pass by the vehicle in front. This causes the horse to shy and perhaps to upset the cyclist. Riding too close behind a vehicle is another cause of accident. The cart, or whatever it may be, suddenly pulls up, the cyclist rushes into it and is thrown, and another vehicle passes over him. Want of knowledge or willful disregard of the rules of the road, too, has been the cause of several deaths and severe injuries. It is not, however, always the fault of the cyclist that accidents happen in our crowded thoroughfares. The intolerance of cabmen, the reckless driving of butchers' traps and milk carts and light vans carrying provisions are too well known to need comment. Cabmen, too, often delight in causing as much inconvenience and annoyance to cyclists as they possibly can do, and we have been witness of a cabman deliberately crossing to the wrong side of the road in front of a cyclist for no other purpose than the wanton one of causing the latter to dismount. Drivers of light private vehicles again frequently show the utmost contempt for the cyclist, whom they seem to think has no right whatever to the use of the road. This feeling on the part of drivers often shows itself against pedestrians, and it cannot be too frequently pointed out that the road is not the exclusive property of the drivers of horses and carts. Faulty machines are a source of accident which manufacturers should be made responsible for. Several accidents have occurred lately from this cause, and we greatly fear that the increasing demand on the part of the public for machines will not tend to lessen this cause unless manufacturers are made liable. Two serious sources of danger are the use of the crowded roads by learners and the hiring out of machines to novices. A busy road would seem to be the last place a sensible person would select for learning to ride a bicycle, yet three deaths have taken place from this cause within the past few weeks. The hiring out of bicycles to children and roughs bent on what they call a "spree" should be checked by law. It should be quite possible to license those who let out cycles for hire, and such persons should be made responsible if an accident occurs through the letting out of a machine to an incompetent person.

The cases which we have mentioned are not hypothetical, but have been drawn from a list of recent accidents, and we have instanced them with the object of showing that the accidents connected with cycling are for the most part preventable. Our contemporaries who are devoted to the interests of "wheeling" have, we know, already done good service in this respect, but we venture to assert that if they would impress even more strenuously upon the cycling public the importance of strictly attending to some such simple rules as the following, much good would ensue. These rules are not intended to be exhaustive nor are they for the expert cyclist, although even the experienced rider should not ignore them.

Thoroughly examine your machine before starting on a journey.

Do not ride without a brake, which should be attached to the back wheel, if possible.

Beware of tram lines, especially when they are wet.

Avoid turning sharply on a wet or "greasy" road.

Pass horses at a slow speed.

Never take the feet off the pedals when riding down hills.

Do not ride with the hands off the handles, especially in crowded thoroughfares.

Ride carefully when passing side streets or the carriage entrance to houses.

Before attempting to pass another vehicle, ring the bell when at least twenty yards distant. This will give the rider time to see what the intentions of the driver of the vehicle in front are, and will enable the cyclist to take precautionary measures in time, should such be necessary.

When riding in parties, vehicles should be passed in single file.

Warning by the bell should be given in as gentle a manner as possible. The sudden ringing of a loud gong is apt to cause a pedestrian to lose his presence of mind and run into the very danger it was the intention of the cyclist he should avoid.

When riding behind vehicles in a crowded thoroughfare, be prepared to dismount at a moment's notice if necessary.

Keep on the proper side of the road.*

Ladies should not attempt to ride in the public thoroughfares until they have absolute control over and confidence in their machines. They should keep as near as possible to the curb and ride slowly.

Those who wear a skirt should see that it is not too long. It should be lined in front with some glazed material in order to prevent friction, and all loose drapery which is likely to be caught by the wind and perhaps caught in the machine should be avoided.

In addition, we would suggest that persons who let out cycles for hire should be under the control of the police. It should be a punishable offense to let out machines not in proper order and no child or other incompetent person should be allowed to hire a machine.

It should be possible for the police to prevent novices learning to ride in the public thoroughfares.

Railway companies should issue cheap tickets for cyclists and their machines in order that riders might be enabled to commence their journey as far as possible away from crowded thoroughfares.—The Lancet.

Diet as a Moral Agent.

A food experiment is being tried at the Elmira Reformatory, in New York State. All civilized nations hold out some inducements to the criminals in confinement to sooner secure their release from legal restraint. A certain amount of time is always taken off for good behavior. The criminal has often been exhorted to this end by father, mother, sister, brother and by others who had his interest at heart. His manhood, his future, his ambition and his hope of quick release from confinement have been appealed to and in many cases in vain. Now it is to the man's stomach that the appeal is to be made.

The proposed experiment contemplates, says the Medical Review, a somewhat enlarged scale of dietary privileges, increasing from grade to grade, from the lowest to the highest, so that within due and proper limit of indulgence of the appetite by prisoners in a prison reformatory for crime they can out of their own accumulations have the privilege to select meals at their pleasure, provided always that they keep their expenditure within the limits of the reformatory. The prisoners, under the wage earning system of the reformatory, as it is at present, must earn their living and keep a credit balance to their accounts, respectively, in order to progress toward their release by parole. A prisoner, to maintain a credit balance must needs restrain, regulate and exert himself in a manner which accomplishes and shows his improvement; but hitherto the diet rate has been inflexible. It is believed that if more latitude is allowed and the prisoner has a chance of tickling his palate occasionally with mince pie, a juicy roast or other homelike dainties, he will be more likely to make an extra effort to reform. In other words, if he has an inviting menu to choose from for breakfast, dinner and supper, he will get up and be a man.

*This rule must be applied with intelligence. There are cases when a deviation from the strict rule will prevent an accident.

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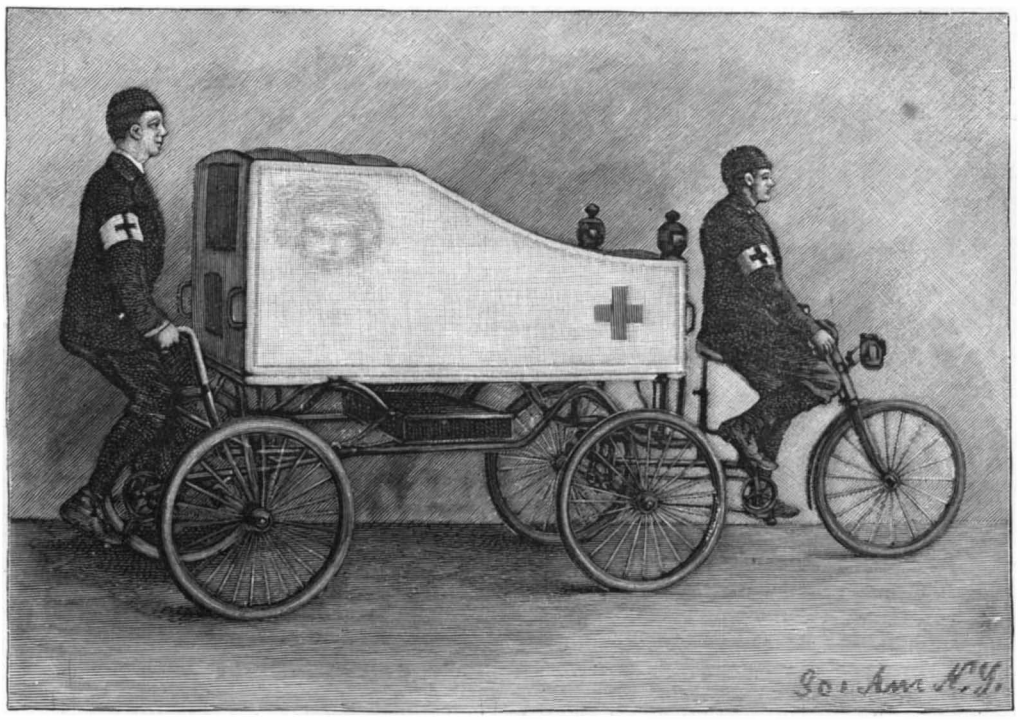
A VELOCIPEDE AMBULANCE.

The greatest novelty in the bicycle exhibit at the Berlin Trade Exhibition is a velocipede ambulance, patented in the United States, December last, by the inventor, Dr. Honig, of Berlin, Prussia. The invention is already in use at the Royal Charité Hospital, Berlin, and is pronounced by those capable to judge of its merits to work admirably and smoothly.

By the use of this velocipede ambulance, all the many disadvantages arising from the use of horses are obviated, the transportation of the patient is accomplished with more ease and comfort, all jolting is avoided and much trouble and expense spared. Whereas it is often difficult to obtain stabling for the horse ambulance, this vehicle can be easily housed in private buildings. The arrangement of this new velocipede is very simple. The litter, which can be easily raised, is provided with a canvas covering, adjustable head rest and mattress, and can, in severe cases, serve as a bed; it rests on strong springs supported by bearings, running on five wheels, provided with pneumatic rubber tires, of which the four rear ones support the body of the ambulance, the front one serving as a guiding wheel. The vehicle is propelled by two persons, the one sitting in front acting as driver, the one behind keeping his eye through the rear window on the patient within. Two side windows admit light to the interior, which at night is lighted by electricity, fed by an accumulator. The vehicle is well ventilated by an arrangement in the top of the canvas covering. A box underneath serves to hold medicines, bandages and instruments. The litter is so arranged, at a convenient height from the ground, as to admit of operations being performed upon it. The slight weight of the ambulance admits of a high rate of speed. Taken all in all, this velocipede ambulance is worthy of a Yankee's brain, and ought to come into general use and favor in our hospitals and become an indispensable accessory at all sanitary, police and fire department stations. The ambulance can be widened so as to accommodate two litters, thus making it a useful adjunct for army purposes.



VELOCIPEDE AMBULANCE—READY TO START.

Some Facts About Bananas.

It is hardly necessary to state that well matured bananas that have not begun to decay are a very wholesome and nutritious food. No more than that the biggest apples or pears always are the best, are the biggest bananas the finest flavored; on the contrary, the larger they are the more mealy they taste.

It is with bananas, as with other fruit, that poor soil, producing small fruit, generally compensates in the quality of these for what the bunches lack in size, and yet these latter are left to rot in the plantations because they are less salable, while only the larger bunches of inferior flavor are exported.

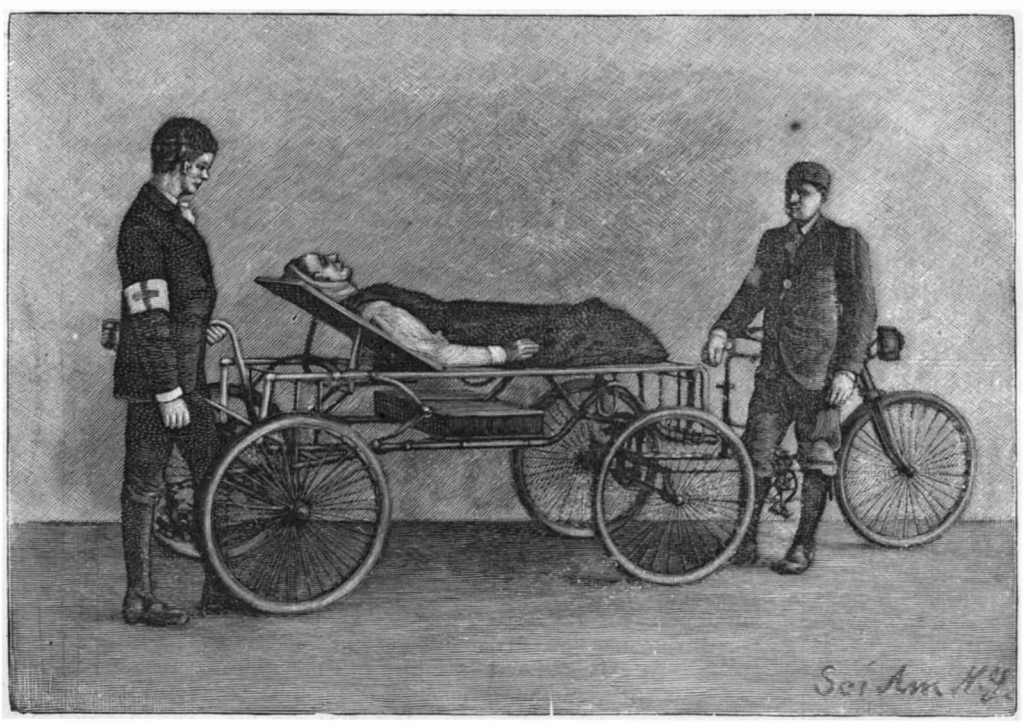
To attain its best condition, the bunches should be cut what is called two-quarters and a half ripe, when the fruit is full of juice—that evaporates if left to be three-quarters ripe. The hardening of the rind, after cutting, if exposed to the sun and protected from wet, retains the juice. But if left to ripen on the tree, the juice evaporates and the fruit has hardly any taste at all. Again there is just as much variety in bananas as there is in other fruits, and several kinds that on account of their small size are not exported, would undoubtedly find ready sale in the United States. To the man who buys a nickel's worth of bananas it ought to be immaterial whether they come off a six hands bunch or a ten hands. Your six hands bunches, containing 288 fruit, are given at the same price as one nine hands with 108 fruit, and during the nine months in the year when there is no sale for bunches below eight hands. In this point the planters lose, but the public in the United States does not gain, as the people generally hardly know what good bananas are, or the consumption would be doubled.

The cultivation of bananas, although it has in the last ten years assumed gigantic proportions, may still be said to be in its infancy. Almost every part of the plant can be used for some useful purpose; the stalk forms an excellent material for the manufacture of paper, or the fiber might be extracted; the peel of the fruit will make excellent indelible ink; the green fruit dried can be converted into wholesome flour.

One acre of land planted in bananas, if properly cared for as it ought to be, is capable of yielding an enormous crop, and by having ten acres to attend to, an industrious man could make a good living, even if he only worked one hour a day. The fruit of a single tree sometimes weighs 70 to 80 pounds; or ten trees average 30 to 40 pounds. According to Humboldt's estimate, 10,000 square feet, which will yield only 462 pounds of potatoes or 38 pounds of wheat, will produce 4,000 pounds of bananas, and in a shorter period of time! The fruit, however, when ripe, consists of 74 per cent of water; of the remaining 26 parts, 20 are sugar and 2 gluten or flesh-forming food. Hence, like rice, though exceedingly nutritious, it requires the addition of some more nitrogenous material.

Green bananas, boiled tender, if given to the hens cut up, will make them lay more eggs than any other food.

Yet, in spite of all this, the banana planters at present are hardly making a living, on account of the discrimination of the railroads against the small bunches, by charging the same rate on single small bunches as on big ones, instead of rating them by weight. Dried bananas, or banana figs, as they are called, are now in the market, and will undoubtedly soon be a great article of trade as soon as found by the schoolboy. They are sweet, wholesome and nourishing. — The Sanitarian.



VELOCIPEDE AMBULANCE—PATIENT RECEIVED.

THE splendid botanical garden at Buitenzorg, Java, has the finest collection of palms in the world. There are three hundred determined species, besides about one hundred which appear distinct.

England's Great Museum.

A blue book is just published containing an account of the income and expenditure of the British Museum (special trust funds) for the year ended March 31, 1896, and a return of the number of persons admitted to visit the museum and the Natural History Museum in each year from 1890 to 1895, together with a statement of the progress made in the arrangement, a description of the collections, and an account of the objects added in 1895. The purchase from the Duke of Bedford of the houses and gardens immediately contiguous to the museum for the sum of £200,000, granted by Parliament, has been completed. The total number of visitors to the museum in the year 1895 was 542,423, a falling off of more than 36,000 from that of 1894, which, however, was unusually high. The total number of visitors to the reading room during the year was 194,924, being 8,000 fewer than that of 1894. The daily average was 643. The number of volumes supplied to readers was 1,405,866, as against 1,470,191 in 1894. There was generally a reduction in the numbers of visits of students to the several departments, as will be seen by comparing the total number, 232,484, with the 264,864 of the previous year. Indeed, the number for 1895 is smaller than that of any year since 1890. Next to the reading room in popularity come the newspaper room and the department of manuscripts. The number of visitors to the collections in the British Museum (natural history) in 1895 was 446,737, a larger number than in any year since 1890. Of the general progress made at the museum, Bloomsbury, during the year it may be mentioned that the collections of antiques, ornaments in gold and silver, and engraved gems have been rearranged in the new gold ornament room, which has been thrown open to the public; a more scientific arrangement of the sculptures from the site of the Temple of Diana at Ephesus has been taken in hand, and the excavations commenced in Cyprus in 1893 have been continued on the ancient site of Curium.

Two purchases of more than ordinary interest were made from funds specially voted by Parliament. The correspondence and papers of Lord Nelson, which were in the possession of Lord Bridport, were secured for £3,000, and the very choice cabinet of drawings by old masters and of early Italian and German engravings formed by the late Mr. John Malcolm, of Poltalloch, passed into the hands of the trustees for £25,000.

The additions to the reading room consist of 34,337 volumes and pamphlets, 70,394 parts of volumes, besides maps and pieces of music while the number of newspapers published in the United Kingdom and received under the copyright act during the past year has been 3,098, comprising 205,646 single numbers.

The most remarkable acquisition made during the year was that of 1,014 editions and translations of the "Imitation of Christ."

Electricity in Mineral Waters, and Its Therapeutic Influence.

It has very generally been claimed that artificial mineral waters are far less efficacious than are the natural waters themselves, and it is known that many watering places produce effects upon patients submitted to the regimen there prescribed which cannot be explained upon the basis simply of the chemical composition of the water. Several learned authorities have ascribed this to the negative electricity with which the water is charged. Zinno (Bolletino Chim. Farm.) attributes the unexplained therapeutic activity of these waters to electricity, but believes that the electricity is generated to a certain extent by chemical changes which occur in the constituents of the water. The electrical energy contained in the waters, as indicated in the galvanometer, disappears more rapidly where the water is contained in closed vessels than when left open. It sometimes disappears within a few hours, and sometimes not until within several days after the water has been taken from the earth.

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THE LOFTY BUILDINGS OF NEW YORK CITY.

(Continued from first page.)

center of business in any of the great cities of the world which is so shut in by the natural conditions of the site upon which it is built as the southern end of New York City, lying between the City Hall Park and the Battery. This was the original city; and the location within it of the Custom House and the City Hall, and the Treasury, with its inevitable concentration of banks, brokers' offices and insurance houses, has enabled this locality to maintain its standing to this day as the most important commercial center of the whole city. In comparison with the magnitude of the interests which are represented within its borders, its area is exceedingly small, even if we include the belt of artificial ground above mentioned; and as a consequence there has been an appreciation in the value of land for which no parallel can be found in any city of the world. The greatest increase, as was to have been expected, has taken place upon property which fronts upon Broadway or that lies within the banking district in the neighborhood of Wall, Pine, and Nassau Streets and Park Row. As instances of this it may be mentioned that the lot upon which the Manhattan Life Insurance building stands was purchased for $157.02 per square foot; that No. 141 Broadway cost $181.12 per square foot; and that before they could even dig the foundations for the Surety building the syndicate had to pay for the site at the rate of from $176 to $282 per square foot. Now it is a matter of very simple arithmetic to prove that at the ordinary rate of office rentals it would require in the case of the Surety building the erection of a structure many stories in height to pay merely the interest on this enormous land value; that above this building must be raised another lofty stretch of stories to pay the interest on another vast sum representing the cost of the building itself; and that above this again must be other stories, whose rental shall go to pay for the operating expenses, such as lighting, heating, water supply, sanitation and repairs, not to mention insurance and taxes. Whatever further additions it may be possible to pile up above this level may be looked to for the future profits of the undertaking.

From these considerations it is evident that the raison d'être of the lofty office building—at least in New York—is to be found in the enormous appreciation in land values; while this, in turn, is mainly due to the concentration of vast commercial interests within a restricted area. At the same time it is certain that, in regard to the relation of land values to the height of buildings, the effect has, in some measure, become the cause. The system of steel construction, which has quadrupled the size of building which it was formerly possible to erect upon a given area, has assisted to raise the value of land to its present high figure, and give it a value which it would not otherwise possess.

The accompanying diagram has been prepared with the object of showing the extent of what might be called the vertical growth of the lower city during the past few years. It covers all that part of New York bounded by Duane Street and the Battery and the East and Hudson Rivers, and it includes all the structures built or building which are above seven stories in height. The areas at the various levels are estimated upon the basis of the lot dimensions; and it is to be understood that no deductions have been made for court areas. Where the upper stories do not cover the whole building, as in the case of those buildings possessing towers, the area is calculated accordingly. The height of a building in stories is estimated by the number of bona fide office floors, even if they are included in a tower above the main body of the building. Thus the new building in course of erection on Park Row is put down as twenty-nine stories in height; since the twenty-eighth and twenty-ninth stories in the two towers are contained within masonry walls, and are commodious rooms, measuring some 22 feet each way.

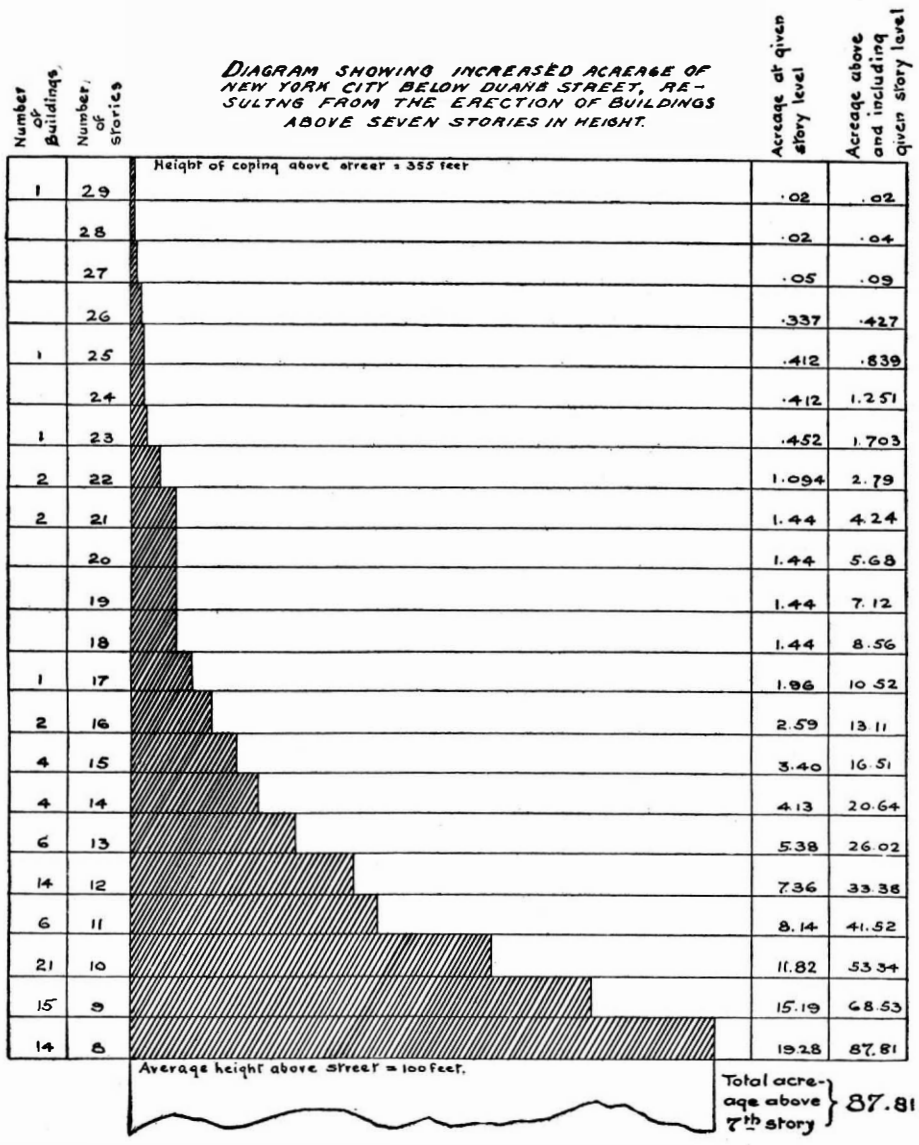
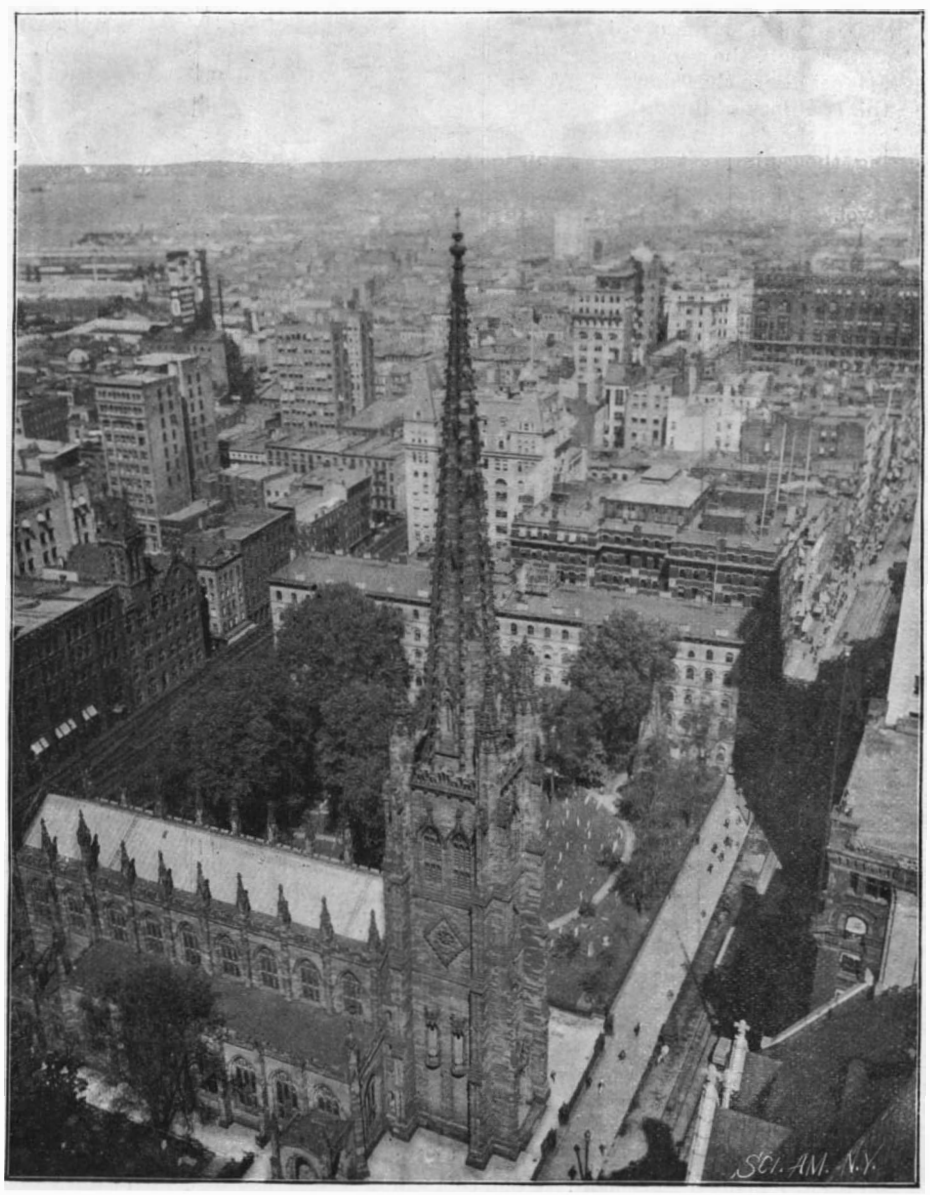


DIAGRAM SHOWING THE AREA, NUMBER, AND HEIGHT OF TALL BUILDINGS IN LOWER NEW YORK.

The first two columns of the diagram show the number of buildings of any given number of stories in height. The shaded portion and the third column show the areas for all the buildings at any given story level, and the last column gives the total area above and including any given story level. Thus there are in the district in question fourteen twelve story buildings, the aggregate area of whose twelfth

The St. Paul Building on the site of the old Herald Building. Height, 25 stories, 307 feet.



Bird's eye view of Trinity Church and vicinity from Manhattan Life Building

THE TALL BUILDING PROBLEM IN NEW YORK.

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floors is 7·36 acres. This added to the total area of all floors above the twelfth, in buildings over twelve stories high, gives 33·38 acres as the total area above and including the twelfth story level. We thus arrive at a final estimate based on lot areas of 87·81 acres, as representing the total floor space added to the city in this district by carrying up these ninety-four buildings beyond the seventh story level. Their average height is 10·7 stories, and if we take 5 stories, which is the basis commonly used by real estate agents in New York City, as being the average height of the buildings which were put up fifteen to twenty years ago, we find that the ninety-four buildings in question represent a clear gain of 5·7 stories to the city, the capacity of the 19·28 acres upon which they stand being thus more than doubled. To put it in another way, it may be said that there has been already an addition of nearly 20 acres of ground area to the city as the result of the modern system of construction.

It may be remarked in passing that while the remarkable building activity of the past three years has been due to the concentration of business, to the facilities offered by the modern system of construction, and to the fear of legislation restricting the height of buildings, it is largely owing to the fact that capital has sought this form of investment, because of the uncertainty affecting investments in such of the Western States as have enacted laws hostile to capital, or which have been dominated by the theories of the Populists.

Of the scenes chosen for illustration, perhaps the most familiar will be that which includes the City Hall and the adjacent buildings, in which some of the leading daily journals make their homes. Respectively to the right and left of the picture are the Times and the World buildings, which are good examples of the earlier lofty buildings of composite construction. The small building on the corner opposite the World is the home of the New York Sun, and adjoining it is the Tribune building. At the time of its erection, twenty years ago, this was the architectural wonder of the day.

The thickness of the lower walls shows us that the limits of economical height for a structure of solid masonry had been reached in this building. To the rear of and dominating the Times building is the handsome new structure known as the American Tract building.

The main structure is twenty stories high, the top cornice being 244 feet above the sidewalk. Above this is a block of three stories, which covers the western end of the building, the ceiling of the twenty-third story being 272 feet above the street level. The approximate weight of steel columns and girders in this structure is 2,800 tons.

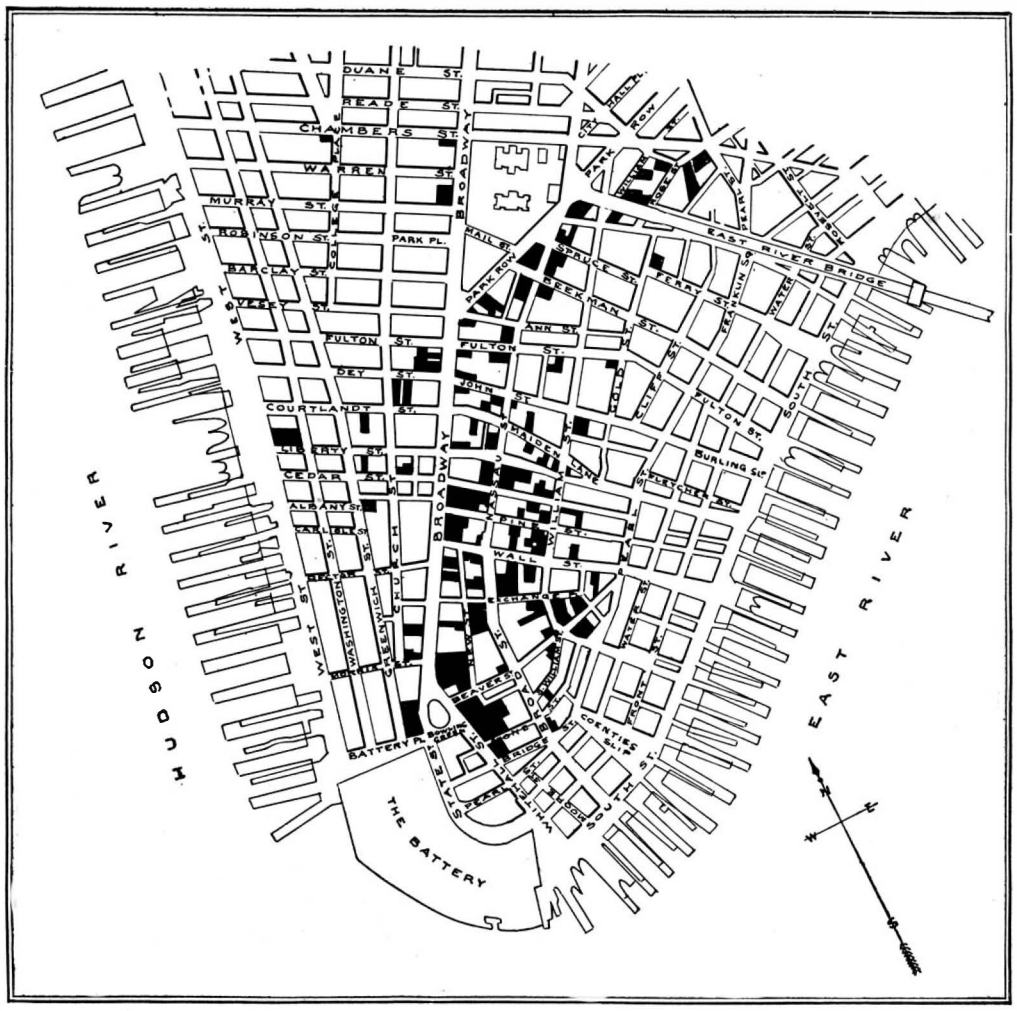
Another of our views is taken from the west side of Broadway, opposite the Post Office, looking south. The unfinished structure at the corner of Broadway and Ann Street is the St. Paul building, 25 stories in height. The foundations extend 31 feet below the street, and the coping will be 307 feet above the same level. The total combined dead and live load of the whole building will be 19,859 tons, and this will be carried upon a lot whose area is only 5,778 square feet. The foundation consists of an unbroken layer of 12 inches of concrete, with footings of steel grillage.

About a quarter of a mile further down Broadway is seen the towering mass of the Surety building, which from a base about 83 feet square towers up 312 feet above the street level. It is 21 stories high. The caisson foundations extend to the rock, 72 feet below street level, the whole structure from base to summit measuring 384 feet. There are 3,500 tons of steel in the superstructure alone.

The most notable building now in course of construction is being erected on Park Row. It will cover an area of nearly 15,000 square feet, and in no part will it be less than 25 stories in height. The front facing the Post Office building will be 27 stories in height, the top cornice being 336 feet above the street level. The two flanking towers will each contain two stories to be used as offices, the cornice of the towers being 355 feet above the street and the top of the lantern 386 feet above the same level. The foundations will extend 34 feet below street level, making the total height of the structure from top of piles to top of lantern 420 feet. The foundation will consist of piling capped with 10 inches of granite bedded in cement. Upon this will be 4 feet 9 inches of brickwork, stepped up to a granite capping. Upon this will be placed a grillage of steel I beams and a series of huge box girders, some of them 8 feet deep, for distributing the pressure of the columns evenly to the brickwork. The largest of these girders weighs 55 tons. The approximate weight of steel in the building will be 9,000 tons; the total dead and live load will be about 50,000 tons, distributed upon some 4,000 piles.

To those of our readers who may not have visited this city since the era of tall buildings has set in, the most impressive view of all will be that in which the spire of Trinity Church figures in the foreground. The photograph was taken from the top of the Manhattan Life Insurance building, at an elevation of over 300 feet above the Broadway curb. Trinity Church spire, 288 feet high, was for many a decade the tallest landmark in or around New York; but now the visitor to the city can look down upon its cross from a point many feet above it.

Although the tall building is serving to multiply the number of business interests which can be accommodated within the area of the lower city, it is bringing with it many serious drawbacks which render its all around utility very doubtful. A startling evidence of this is seen in the dark shadow cast across Broadway and over the whole face of the five story building on the western side of the street by the twenty-one story Surety building, whose white wall can just be seen on the right side of the illustration. The smaller shadow is cast by the eight story building adjoining it. Broadway, actually a fine thoroughfare, if it be flanked by many more of these giant walls of steel and stone, will ultimately become a narrow canyon from which sunlight and air will be all but "quite shut out."



MAP SHOWING LOCATION OF TALL BUILDINGS IN LOWER NEW YORK.

Electrical Hardening of Steel.

A French technical journal announces a new invention in the field of electrical metallurgy, says the Electrical Review. It is a process which will give an extraordinary hardness to steel. It is reported that the inventor, a Mr. Taux, has executed the following experiments before a committee of engineers at Strasburg. A drill hardened by electricity pierced a shell twice as quick as a drill of the best steel hardened in the ordinary way. The drill was closely examined afterward by means of a strong microscope and not the least injury could be discovered. An electrically hardened circular saw cut iron bars with surprising ease. With a cold chisel similarly treated a steel bar, one by one-half inch, was cut through and the operation was repeated five times on the same bar. Then a cast steel plate, one-quarter inch thick, was cut with the chisel, the edge of which showed neither a fissure nor any other alteration afterward. An electrically hardened table knife cut iron wire of one-eighth inch diameter just as easy as cotton string. The process is said to consist in the hardening of the red hot steel objects in a conductive bath traversed by an electric current. If these tests should confirmed by further practical experiences, the consequences would be of the greatest importance for the manufacture of tools.

Improved Method of Electro-Plating.

According to the London Standard, an invention which promises to be of great importance to the electro-plating trade has been brought out by Messrs. A. S. Smith & Sons, Walsall. Hitherto articles on which a deposit of metal is desired have had to be suspended in the electrolyte by means of wires, and after remaining in the solution for a stated time they have been taken out in a dull or unpolished condition, and subjected to another process for polishing or burnishing them. By this invention, it is claimed, wiring is done away with, and no "moppers" (polishers) are required. What this means as a saving in the cost of plating any practical plater will understand. In addition to this, it is stated, three to four times the amount of work can be turned out in the same time as heretofore.

The system, we understand, has been in operation in Messrs. Smith & Sons' workshop for the last seven or eight months. One important advantage is that no interference with the existing arrangements of vats, solutions, or dynamos is involved. All that is required extra is shafting to be placed over the vats, for the purpose of supplying motive power. The process is not suitable for the plating of such articles as teapots, trays, art work, and the like; but as regards seventy-five per cent of all platable articles, we are informed, whether the deposition required is of nickel, copper, brass, tin, or zinc, a perfectly bright and lustrous surface is given, with a thicker, more malleable, and more lasting deposit than heretofore by means of the apparatus in question.

The articles are placed in large quantities in a revolving hollow container—theoretically there is no limit to the quantity, but practically it may be found advisable not to have more than 90 or 100 pounds at a time—and this container is suspended or supported within the electrolytic bath, and during the time the deposition is taking place is subjected to a rotary movement varying from fifteen to fifty revolutions per minute. The container, which is mounted centrally upon a long insulated metal sleeve, is made of non-conducting material, and its walls are perforated in such a way as to allow the fluid to circulate freely through it, and to act upon the work contained therein. The sleeve, with the container carried by it, is fixed to a central metal rod or box, supported by metallic bearing brackets clothed in wood or other suitable insulating material and fitted at equidistant points in its length with copper contact arms. These latter are mounted in such a manner as to always be in intimate contact with the articles placed in the container, acting as channels for the passage of the electric current to the negative pole of the generator.

The anodes (or positive terminals) are slung upon their supporting rods around the inside walls of the vat in the ordinary manner, or in rows to get more anode surface, as the case may require, so that there is nothing in the interior of the container to interfere with the continued rolling movement of the articles placed therein. The electric current is sent through the solution and back to the generator by means of the articles being plated (the cathodes) through the contact arms or their equivalents, and thence through the sleeve and the insulated rod or bar to the negative pole of the generator. Messrs. Smith do not claim for the invention that it does away with the processes preparatory to ordinary plating. To get good results, the work has to be prepared at least as carefully as it used to be under the old system, and the more careful this preparation, the better are the results.

PERSONS who have catarrh or who easily catch "catarrh cold" find immediate and permanent relief by snuffing a little lukewarm water into the nostrils every morning after rising, first cleansing them thoroughly by blowing the nose. The water may be held in the palm of the hand and thus applied to the nostrils. During an attack of cold in the head this method of treatment will be found very effective. A little salt added to the water is very good, and a drop of carbolic acid is also recommended, but must be used cautiously.

DR. CARL PETERS, the explorer, is said to have left Germany for good and to have left directions to have all his affairs there wound up, since the sentence of Herr Schroder, the East African administrator, to fifteen years' imprisonment at hard labor for brutality to the natives.

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Headaches of Different Kinds.*

No more frequent ailment of a nervous character presents itself for treatment to the refractionist than cephalalgia or headache. The sufferers from this affliction are everywhere. Subjects of chronic headache have often inherited the tendency and are of a highly nervous temperament. They have tried all kinds of treatment, sometimes with partial relief, but never with permanent benefit, because the underlying cause of the trouble has not been removed. Hence, on slight excuse, the old trouble has returned.

Headache is of various kinds, according to the exciting cause. Thus there are catarrhal, gastric, and nervous headaches; and again, some headaches are caused by tumors of the brain. In most cases the seat of the pain is in the scalp, or the occipito-frontalis muscle, which lies just beneath the scalp. For this reason pressure or hot or cold applications give temporary relief. In no case, however, is the trouble local, except when there is intracranial disease. The pain is always of a reflex character, and we must look to a point more or less remote for its origin. Again, in those cases where the trouble frequently recurs, there is, besides the direct exciting cause, some deeper seated predisposing agency. Anything which reduces the reserve nervous power to such an extent that it is insufficient for an emergency may be the underlying cause of headache. Rectal disease, female complaints, secret vice, and a score of lesser evils act in the manner indicated. There is, however, no more frequent source of nerve waste than that which comes from some defect in the refraction, accommodation, or convergence of the eyes. The organs of sight are in constant use, adapting themselves instantly to every change of position and distance of the object looked at.

If an eye is defective anatomically—too short from before-backward, as in far-sightedness (hypermetropia), too long, as in near-sightedness (myopia), with an irregular curvature of the cornea, as in astigmatism, or if the two eyes are not evenly balanced in muscular development (heteraphoria), we have in such cases a causative factor of headaches which is permanent, is usually inherited, and is a constant source of waste of nerve power, and the removal of which in ninety-six cases out of a hundred has been found to relieve a coexisting chronic headache. Hence, from practical results, we are warranted in saying that every case of headache should apply to the skillful refractionist, before wasting time and money and nerve power in seeking relief with medicine. Our present civilization and school system have a marked influence in producing and perpetuating neuropathic tendencies. The close room into which threescore children are packed at the period of physical development, the close application to books which is expected of them, the defective light, the bending position which from very weariness they assume, and the incentive to stand at the head of their class to which neurasthenic children always respond, are potent factors in producing eye strain and its many reflex disorders. It is to this period of youth that most sufferers with chronic headache can point as the time at which their trouble began.

Symptoms.—Pain in temples, over eyes, and at the back of the head, rarely on top. Paroxysmal, either at regular intervals, or after some especial excitement, care, work, or strain. In women there is often great pain at the seventh cervical vertebra at the base of neck and also at the lower point of shoulder blade or scapula. Others have pain between the two scapulae or in the lower part of the back. In men the pain is in the occipital muscle, and is spoken of as if at the "base of the brain."

Chronic headaches cause a feeling of lassitude, incapacitating the person for mental labor and often causing them to exclaim: "I fear I am going insane."

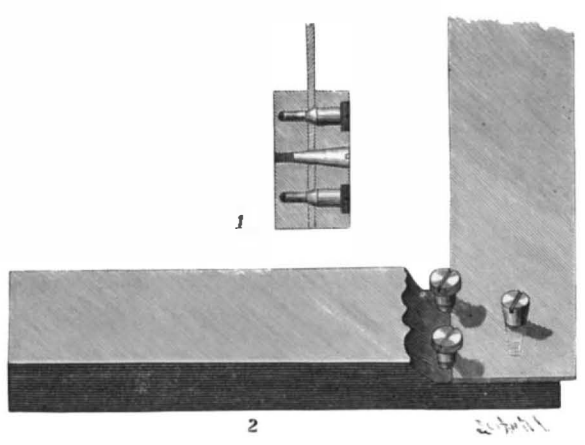
Migraine, or sick headache, is a more severe form of the trouble and recurs with great frequency. The eyes become painful, especially when turned quickly or pressed upon. There is often dimness of vision, glimmering or even momentary vanishing of sight, so that the patient speaks of the attacks as "blind headaches." The torture usually reaches the point where the patient must go to bed in a room protected from light, noise, or a draught of air, which sometimes become unendurable. Occasionally the pain is so intense as to draw the head backward between the shoulders, and it may result in total nervous prostration for the time being. Temporary relief is at times obtained from traveling, from medicine, or from prolonged rest. After years of suffering, the form of the disorder may change to a neuralgia, asthma, or other ailment, but this is not a cure. Nothing will cure the affection permanently until the underlying cause is removed. Unlike ordinary headache, migraine does not so often yield to refractive correction, because it is more often due to a muscular heteraphoria and can only be cured with higher prisms or by a tenotomy.

IT is proposed to erect a monument over the grave of the electrical discoverer, Georg Simon Ohm. Subscriptions will be received by the Königliche Filiabank, Munich.

* By E. T. Allen, M.D., Ph.D., editor of the American Jeweler.

AN ADJUSTABLE SQUARE.

Nothing can produce more vexation and unnecessary labor in mechanics than the use of a square which, through some accident or defect in manufacture, is slightly out of truth. Its effects are cumulative and it compels the workman to perform his work by the cut and try method, which belongs to the past. Our engraving shows a square devised and made by Mr. D. H. Dugar, a mechanician of the Watertown Arsenal. This square has a blade pivoted on a conical screw and adjusted by two conical screws inserted in the heavy part of the square and bearing against the inner edge of the blade, as shown in Fig. 2, in which a portion of the square is broken away to more clearly show the construction. By slightly turning in one of these screws

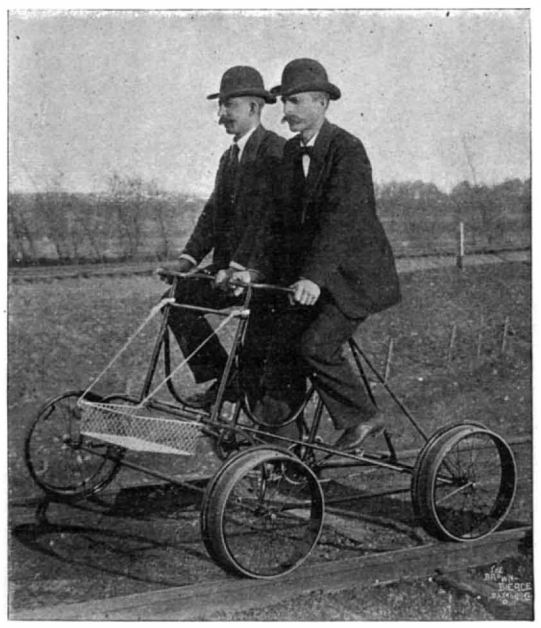


AN ADJUSTABLE SQUARE.

and unscrewing the other the blade may be adjusted as desired, and when so adjusted it is securely clamped by the pivotal screw.

A NEW BALL BEARING INSPECTION CAR.

At the recent roadmasters' convention at Niagara Falls the Railway Cycle Manufacturing Company, of Hagerstown, Ind., exhibited two of their Hartley and Teeter inspection cars. A novel experiment was tried with one of them on the famous Gorge road. The car was run down the steep incline to the cantilever bridge and back. Our engraving shows the general appearance of the double seated inspection car. Ball bearings are used, the car being provided with a self-contained bearing case which covers the axle. In this case are placed the ball bearings, composed of two parts. All side strains caused by the weight of the rider are thrown upon the bearing case and do not bind upon the bearings or the axle. The axle itself is independent of the frame and can be removed by loosening the set screws



THE NEW HARTLEY & TEETER BALL BEARING INSPECTION CAR.

on the sprocket wheel and removing one nut. The car is light, but is exceedingly practical and durable.

How to Prepare Calcium Tungstate for X Ray Screens.

BY C. E. TENNANT, M.D.

As the readers of the Electrical Engineer may be interested in the subject, I give the results of my recent experiments with the calcium tungstate. I find that the compound made after this manner gives the most satisfactory results of any fluorescent substance now known, especially on large screens, the size of the body, and these screens can be made for a price not to exceed 25 cents each, by any novice.

The spreading of the calcium tungstate evenly over the surface offers the greatest difficulty, but with a little practice can be readily overcome.

To two parts of sodium tungstate add one part of calcium chloride; fuse the mass to a red heat. A resulting compound of calcium tungstate and sodium chloride is formed. This latter salt exerts active hydroscopic properties and, as a result, renders the calcium tungstate quite negative to the X rays. But immersing the fused mass in water for an interval of forty-eight hours disposes of the salt, as well known by its property of solubility, while the insoluble calcium tungstate remains a precipitate. This latter is now separated by filtration, and when dry assumes a crystalline formation and is very sensitive to the X rays.

An amorphous preparation of calcium tungstate may be obtained by adding a saturated solution of sodium tungstate to a solution of calcium chloride, which results in the precipitation of the calcium tungstate, but this amorphous crystalline form is absolutely worthless for use with the X rays.—The Electrical Engineer.

The Amount of Water in the Earth's Crust.

In order to ascertain the amount of mechanically contained water in the earth's crust, I recently made the following computation, says W. B. Greenlee, of Ithaca, N. Y., in the American Geologist:

I considered it safe to assume that the crust of the earth is filled with water and that the maximum porosity of rocks which can be obtained in the laboratory, though not the greatest possible porosity, is less than that of the crust of the earth for a distance of one mile from the surface.

One mile is taken as an approximate thickness, since that seems to be a fair average of the thickness of sedimentary rocks over the surface of the earth.

Assuming, then, that the earth is saturated with water to the depth of one mile, we have next to determine the relative amounts of its constituent rocks and their respective porosities.

The surface of the earth may be divided into two divisions, first, that covered with sedimentary rocks, and, second, that covered with igneous and metamorphic rocks. To ascertain the relative areas, the United States and Europe were selected as typical of the land surface. The United States was divided into three regions: (1) that east of the Mississippi River; (2) that between the Mississippi and Colorado; and (3) that between Colorado and the Pacific. The first region was divided as to the relative amounts in each State and the results added. The central region was bulked as sedimentary rocks, and the western region was called half sedimentary and half igneous and metamorphic. The results showed that 31·2 per cent of the surface of the United States is covered with igneous and metamorphic rocks.

In Europe each country was separately divided and the percentage of the respective sums taken. This proved to be 19·8 per cent. An average of these results, by coincidence, is 25·5 per cent, or, roughly speaking, three-fourths of the land surface of the earth is covered with sedimentary rocks having an average thickness of one mile.

Difficulty was encountered in ascertaining an average porosity. Sections were taken in various parts of this country, notably the 127,000 feet generalized section of the Rocky Mountains, a generalized section through New York, Pennsylvania and Ohio by various authorities and Fairchild's section at Rochester, N. Y. A mean and average rock would appear to be a fine-grained sandstone or limestone.

The most accurate determination of the porosities of rocks has been made by Prof. Bauschinger, of Munich. He found the average porosity of upward of 300 specimens of sandstones and limestones to be 20 per cent of their volumes. Two per cent may be taken as a low average for igneous and metamorphic rocks.

The most recent and careful computation of the respective areas of sea and land on the earth's surface is that by M. Thoulet in his "Oceanographie." This he gives as 368,000,000 kilog. for the sea and 142,000,000 kilog. for the land, or, reduced to square miles, 142,084,860 and 54,826,200 respectively. Three-fourths of the land is 41,119,650 square miles and one-fourth 13,706,550 square miles. Taking 20 per cent of the former and 2 per cent of the latter and adding we get 8,498,061 cubic miles of water.

Thoulet estimates the volume of the oceans at 1,347,874,850 cubic kilometers, which, reduced to English measure, equals 318,191,728 cubic miles.

The estimated amount of mechanically contained water in a section of a mile over that part of the earth's crust covered by land is thus 2·7 per cent of the water now on the earth's surface, or a layer 88 feet deep over its entire surface.

There is undoubtedly a large amount of water below one mile, but we can only conjecture as to the amount, nor does this estimate include that chemically contained. No estimate was made of the amount of water beneath the bed of the ocean, as we have no way of knowing of what it is composed or how thick the permeable layer is. This, too, would increase the total.

IF castor oil is applied to a wart once a day for a month the wart will entirely disappear. In many cases it will not require so long a time.

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RECENTLY PATENTED INVENTIONS.

Mechanical.

FOURDRINIER MACHINE SHAKE FRAME.—Thomas H. Savery, Wilmington, Del. This frame is arranged to swing at all times so that the upper and lower surfaces of the shake rails or side bars are held in level positions, which is also the case with the table roll journal bearings and all the other fixtures attached to the shake rails. The shake frame is also adapted to support the breast roll so that it can be readily put in place or removed without disturbing any of the other parts.

DREDGER.—Philippe Bunau-Varilla, Paris, France. Wells in which are vertically movable shafts or rods extend through the bottom of this dredge, the rods being lowered into contact with the ground to form temporary fulcrums for the dredge, while the axis of the propellers is arranged transversely to swing about its fulcrum. The movement of the dredge from side to side, and its forward and backward movement, may thus be effected without the use of chains and anchors, such control, and that of the several working parts of the dredge, being effected by an electric current from an exterior source. One of these dredges has been built in Holland for a Spanish railway company, and has had a successful trial on the Leck, a branch of the Rhine. It is illustrated in the SCIENTIFIC AMERICAN SUPPLEMENT of October 3, No. 1083.

CIGARETTE MACHINE.—Domingo Perez y Buñol, Havana, Cuba. This is an improvement on a formerly patented invention of the same inventor for a machine which separates the required quantity of tobacco and delivers it to a receiver section, where it is compressed by a plunger, another mechanism carrying it forward to a wrapping device, where it is met by a wrapper which has been cut off and gummed and placed in position by other mechanisms, the wrapping device then putting on the wrapper, and a finishing device tucking the wrapper ends inward. The improvements covered by his patent relate especially to the tobacco conveying and compressing devices, the gumming device, the mechanism for carrying the receiver sections from one position to another, the wrapping device, and the finishing device or tucker.

MACHINE FOR HULLING COFFEE BERRIES.—Antonio S. Perez, New York City. In this machine the main parts are readily accessible, and are exposed to view when the machine is in operation. The berries are fed down an inclosed passage onto a cylinder with roughened surface, which carries them toward two blades, one of which opens the berries without crushing the grains, while the other blade aids in their separation, the hulls adhering to the cylinder and finally dropping into one box, while the berries are conveyed to another box. An arrangement of sprinkling tubes is also provided to discharge water for cleaning parts of the machine and assist in the separation of the grains from the broken hulls.

Agricultural.

PLANTER.—Ole O. Ovre, Godahl, Minn. This an improvement in corn planters, and is adapted for use in connection with a check row wire, the planter being readily and conveniently attached to the siding frame of an ordinary corn plow. On the frame are seed boxes having connected drop slides, and seed conducting chutes, while a lever having adjustable connection with the drop slide is arranged to be operated by a check row wire. The lower end of each seed-conducting chute enters a shoe of trough shape, behind which follows a covering wheel, the whole construction being very simple, and providing for the regular and effective dropping of the seed.

MOULD BOARD.—Samuel A. Smith, McKinney, Texas. This improvement is adapted to any plow made of a series of spring loops, some movable at the top and others at the bottom of the board, the movable ones being kept in motion by the earth passing over the board. This mould board consists of a rigid frame and a body made of spring wire or rods bent to loop form, some of the loops being free from the frame at the top and others being movably connected with the frame at the bottom. The parts of the frame adapted for attachment to the plow beam and handles serve as braces for the body portion of the board, which is thus given a vibratory motion, rendering it impossible for earth to cling to it.

Miscellaneous.

CLOCK STRIKING MECHANISM.—Charles R. Sing, Branford, Conn. This invention provides a striking attachment applicable to an ordinary clock mechanism, the pieces being so arranged as not to burden the driving mechanism of the clock to any appreciable extent, and the entire device being simple, durable and inexpensive. The mechanism has a spring-controlled striking segment operating in conjunction with a winding segment operated from the hour post, the striking segment being regulated in its striking movement by the rotation of the seconds wheel of the clock mechanism, while a stroke regulating device is operated by the movements of the striking and the winding segments.

CARTRIDGE CARRIER.—Robert F. Walker, Limerick, Ireland. This carrier comprises sling bags adapted to be swung over the shoulder and having at their ends pivotally connected outlet tubes, and a push bar, by the operation of which one or two cartridges may be extracted from the carrier, in proper position to be inserted in the breech of the gun. With this convenience a great number of cartridges may be carried with the least possible fatigue, and the cartridges will be kept dry and prevented from swelling, whether the carrier be worn under or over the coat.

A NEW ADHESIVE.—Peter Murphy, Jersey City, N. J. This inventor has patented a process for making an adhesive to stand between starch and dextrin in point of solubility, the method being simple and inexpensive, and the adhesive being produced in a form adapted for immediate and convenient use. By this method starch is submitted to the action of dilute sulphuric acid and heat, in a special manner, and the product is styled a "subdextrin," well adapted for use as a paste or a glue, and much less expensive than mucilage or paste formed from dextrin.

HOOK AND EYE.—William Walton, Closter, N. J. This is a fastening for ladies' garments which may be quickly applied without sewing, and the entire length of the body portion of the hook or eye be held closely against the cloth, the ends of the fastening portions serving as an abutment to prevent the separation of the hook and eye by direct or parallel movement of the parts. The hook and eye are each made of a single piece of wire, which may be round or flattened. These hooks and eyes are neat in appearance, as they do not bulge or protrude from the material to any appreciable extent, and in unfastening it is necessary to turn the hook at an angle to the eye.

COTTON WOOL MATTRESS.—Ursula S. S. Dahlerup, Copenhagen, Denmark. This mattress is designed to afford increased elasticity, as compared with one made in the ordinary way, promote healthfulness and obviate the necessity for a mattress covering, being therefore more economical. It is made of six to twelve strips of cotton wool fastened together in a bunch or group and formed into a woven fabric, the ends of the warp threads forming the border. Where it is desired to give additional elasticity, a special stuffing is employed, consisting of a woven or plaited cylindrical structure of hard steel wire.

TAILOR'S SQUARE.—Raffaele Moccia, New York City. This square may also be termed a chart, being made of stiff, pliable material, in triangular shape, and there being on it scales to facilitate the accurate cutting of garments for men and women, without necessitating a knowledge of geometry on the part of the cutter. There are special scales for measurements for the half breast of a coat or vest, for obtaining the upper point of the shoulder of the coat and vest, and also for ladies' wraps and garments, for obtaining the upper collar seam of the back of men's garments and the side bodies of ladies' garments, for obtaining the hollow of the back and the width of the armhole, and various other details.

SAFETY RAZOR.—Albert L. Silberstein, New York City. This new razor is simply and strongly made and readily adjustable to bring the blade in proper relation to the guard. The bed plate which receives and supports the blade has at its front end prongs which form a guard, and clips fitted to slide in the side edges of the bed plate engage the top surface of the blade at its sides, a spring engaging the back of the blade and the clips being adjustably held on arms extending downwardly from the bed plate.

CARPET FASTENER.—John J. Moore, Lima, Montana. According to this improvement, a base board is provided with a hinged lower half, which opens out and up to permit the edge of the carpet to be laid close up under the board, there being on the bottom of the hinged portion spurs which engage and hold the carpet when the hinged portion is again closed down. Metal-lined sockets extend in line through the upper and lower portions of the board, and pins passed into these sockets hold the lower portion of the board with its pronged edges in engagement with the edge of the carpet.

DOOR BELL AND MAIL RECEIVER.—Joseph H. Key, Horace Brevard and William R. Purifroy, Rockdale, Texas. According to this improvement, the door bell is combined with a tray or card receiver in the door, the tray being adapted to be pulled out to receive a card, letter or package, which, when the tray is released, is carried inside, the bell being at the same time automatically sounded by the engagement of a bell hammer by a toothed edge on the tray. The bell is sounded by both the outward and inward movement of the tray, its outward movement compressing a spring which draws the tray back when the handle is released.

SKYLIGHT FASTENER AND RAISER.—George M. Parsons, Carson City, Nev. A lever fulcrumed on the skylight casing, according to this invention, is pivotally connected with a second lever which is pivotally connected with the skylight, there being arranged in and sliding on this second lever a locking device connected with a rope or cord extending downward as far as desired. By pulling on this cord the fastener is unlocked, and then, by a further pull, the skylight may be raised and locked in partly or wholly open position, or it may be unlocked and closed and locked in closed position.

BALL CASTER.—Edward Fackner, Brooklyn, N. Y. This caster is more especially designed for use on heavy articles, such as safes, pianos, etc., and has a tubular casing which engages the ball slightly below its middle, there being in the upper part of the casing a screw-threaded flange on which rests a flat apertured disk and a concave spring disk, through which extends a pin with a conical head which engages the ball, the shank of the pin extending through the disk apertures. The device is very strong and simple, and the ball turns readily in any direction in which the article is to be pushed.

BOTTLE STOPPER.—John Flanigan, Fort William, Canada. This is a form of stopper designed to prevent a package which has once been sealed from being opened and again sealed as an original package. The cork is made with an attached seal of a harder material, preferably of glass, which may be fitted in the mouth of the bottle, the seal having an outer and an inner recess separated by a partition which is readily broken. The seal must be fractured before the cork can be drawn, but it cannot be again used without showing that it has been tampered with.

MANICURE IMPLEMENT.—Richard E. Hart, Pittsburg, Pa. This implement combines in one handle or support a knife of peculiar construction, especially adapted for cutting the nails, a nail cleaner and a nail file, the blades being entirely concealed within the handle or adjustably extended.

Designs.

BICYCLE SEAT.—Andrew A. Munro, Flushing, N. Y. The top and sides of this seat are of irregular oval shape, terminating in a front projection, there being a cavity in the upper face of the projection and ovoid side openings in the seating surface.

FABRIC.—Shintaro Yokozuka, New York City. This fabric is made with a surface decoration simulating lace work, and having as characteristic features web and scarf patterns.

NOTE.—Copies of any of the above patents will be furnished by Munn & Co. for 10 cents each. Please send name of the patentee, title of invention, and date of this paper.

NEW BOOKS AND PUBLICATIONS.

BUTTERFLIES. Vol. II. By W. F. Kirby, of the Department of Zoology, British Museum. London: W. H. Allen & Company. Pp. 322, 30 colored plates.

This is one of the volumes of Allen's Naturalist's Library, the scheme of which contemplates three volumes in all on butterflies and two on moths. The standard is high, the arrangement has been the subject of careful attention, and the work is designed to be the most complete and accurate of its kind in the language.

PRESS WORKING OF METALS. By Oberlin Smith. New York: John Wiley & Sons. Pp. 376, 433 engravings. Price $3.

The shaping of metals in dies, as necessitated by the numerous articles now made with interchangeable parts, and which has so greatly reduced the cost of nearly all metal goods, is comparatively modern practice. An almost marvelous variety of articles is now being pressed out of sheet or bar metals which but a few years ago were hand forged or cast. The design, construction, and operation of presses and dies for doing this work form the subject of this book, the author having had years of personal experience in this line.

AMERICAN HIGHWAYS. By Prof. N. S. Shaler, of the Lawrence Scientific School, Harvard. New York: The Century Company. Pp. 300. Price $1 50.

The introduction and rapid growth in popularity of the bicycle has been looked upon with no little favor by many who have never expected to ride a wheel, because of the effect that it has been supposed the general taking up of bicycle riding would have in promoting the improvement of our public roads. And there is no doubt that the general interest taken in improving our highways has been much more active during the past ten or fifteen years, during which the bicycle has had its wonderful growth in popularity, than it ever was before. There are but few matters which better demand attention, in every State of the Union, than the improvement of the public highways, and on this account Prof. Shaler's book is of especial value, as he has long been known as an authority on the subject, being a member of the Massachusetts Highway Commission and a teacher of the technology of roads and road making. The book discusses the different road making materials and their distribution, the methods of constructing and keeping roads in repair and their cost, machines used, etc. There are fourteen illustrations, showing good roads and bad, and a table of contract prices on Massachusetts roads during 1894-95.

THE MINERAL INDUSTRY. Vol. IV. By Richard P. Rothwell and Assistants. New York: The Scientific Publishing Company. Pp. xxxvi, 850. Price $5.

We are not acquainted with any other source where so much, so varied, and such valuable information is obtainable, in such convenient and readily accessible form, relative to the statistics, technology and trade of the mineral industry in the United States and other countries, as is presented in this volume and the three preceding ones which it supplements. Among its contributors are many well known experts in mining and the working of ores, not only in this country, but from all parts of the world where the business of mining is carried on to any considerable extent; and the publication of annual volumes, after the plan followed, makes it possible to present such ample data as to the opening and development of mines, the state of the ore and metal markets, and improvements in manipulation, as to render the work invaluable to investors as well as employes and the higher classes of workmen in all branches of the metal trades. The present volume carries the statistics of the business to the end of 1895, and it may be interesting to note that the grand total of the mineral productions of the United States last year, as valued at the place of production, was $678,000,734, as against $581,221,258 for 1894. In iron, our production was larger than ever before, amounting to 9,446,308 long tons of pig iron, and showing the United States to be the leading iron-producing nation of the world. Taking our output of pig iron at 100, that of Great Britain was 79, Germany 60, and France 21. In gold there was a notable gain in the production for 1895, which reached 2,265,612 ounces, of the value of $46,830,200, while in silver there was a slight decrease, the production of 1895 having been 46,331,235 ounces, valued at $30,244,296. In coal, anthracite and bituminous, the production showed an increase of 17 per cent over the output for 1894 and amounted to 195,761,332 short tons, valued at $215,292,247. The value of the anthracite coal at the mine was $1.69 per ton. Great Britain still leads us slightly in the production of coal, but we are rapidly overtaking her in the quantity mined annually, Germany holding third place, and being far in advance of any other nation.

"The General Digest" is the title of a semi-monthly publication for the use particularly of lawyers, issued by the Lawyers' Co-operative Publishing Company, of Rochester, N. Y. Its price is $2.50 a year, and it is designed to contain all current case law of the United States, and useful English and provincial cases, with references to every publication of the opinions. The "Lawyers' Reports, Annotated," is a similar publication of the same company, as is also a semi-monthly issue of advance sheets of all opinions of the United States Supreme Court.

Business and Personal.

The charge for Insertion under this head is One Dollar a line for each insertion: about eight words to a line. Advertisements must be received at publication office as early as Thursday morning to appear in the following week's issue

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Notes & Queries

HINTS TO CORRESPONDENTS.

Names and Address must accompany all letters or no attention will be paid thereto. This is for our information and not for publication.

References to former articles or answers should give date of paper and page or number of question.

Inquiries not answered in reasonable time should be repeated; correspondents will bear in mind that some answers require not a little research, and, though we endeavor to reply to all either by letter or in this department, each must take his turn.

Buyers wishing to purchase any article not advertised in our columns will be furnished with addresses of houses manufacturing or carrying the same.

Special Written Information on matters of personal rather than general interest cannot be expected without remuneration.

Scientific American Supplements referred to may be had at the office. Price 10 cents each.

Books referred to promptly supplied on receipt of price.

Minerals sent for examination should be distinctly marked or labeled.

(6969) R. E. asks: 1. Is it practicable to cut a large block of ice to pieces by using a wire heated by electricity? If so, what size and kind of wire would give the best results? A. Owing to regelation there would be difficulty in doing this unless a rather large wire were used, and this would involve the expenditure of considerable electric energy. We would suggest a No. 12 iron wire with 5 to 10 amperes of current.

(6970) P. V. B. says: I am making the Wimshurst machine described in SUPPLEMENT, No. 548, and would like to ask a few questions concerning it. Please answer in your Notes and Queries. Could not the spindle supporting the plates be extended from one standard to the other, without interruption, or would it make electrical contact between plates? If not, could not this be remedied by covering central part of the spindle with a vulcanite tube? A. The spindle is extended through as you suggest. Your plates must be very true and parallel to give good results.

(6971) C. L. B. asks: Could a telephone or telegraph be operated on a two-wire fence by insulating the wires with rubber? There are a number of square corners, roadways, etc. Would the barbs interfere with the current? A. This can be done without trouble. In a dry climate insulation may not be needed, the wood being sufficient. If barbed wire is used, then have good lightning protectors.

(6972) C. C. S. asks: What will remove the backing upon an old mirror? Also, is the preparation anything an ordinary person could mix and apply? Being applied what sort of mucilage or glue must be used to stick cloth or leather to the back of the mirror? A. Remove the silvering from the glass around the scratch so that the clear space will be about a quarter of an inch wide. Thoroughly clean the clear space with a clean cloth and alcohol. Near the edge of a broken piece of looking glass mark out a piece of silvering a little larger than the clear space on the mirror to be repaired. Now place a very minute drop of mercury on the center of the patch and allow it to remain for a few minutes, clear away the silvering around the patch, and slide the latter from the glass. Place it over the clear spot on the mirror and gently press it down with a tuft of cotton. This is a difficult operation, and we would advise a little practice before trying it on a large mirror. You can cement on cloth with white lead paint.

(6973) G. E. L. asks: What quantity of wire should I use on the secondary and primary (double silk covered) to get a spark of ½ inch? How much condenser surface is required? Is it necessary to wind a coil of this size in sections, or would it do as well to wind clear across the coil? In using double silk insulated wire, is it necessary to insulate the layers of the secondary coil with paper? What number of wire should be used?

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I intend to use an exciting current of 8 volts, 1 ampere. A. In our SUPPLEMENT, No. 160, you will find described and illustrated an induction coil, but slightly larger than the one specified. The article is so full that we refer you to it for all details of induction coil making.

(6974) C. H. M. asks: What is the igniting temperature of turpentine in the presence of air? A. Turpentine boils at 321° Fah. (about). The vapor emitted would inflame at a red heat, say 1,500° Fah. upward. The oil itself would boil long before ignition, and the flames of burning turpentine may be considered as principally flames of burning vapor, not of burning liquid.

(6975) J. C. B. asks: If the two sprocket wheels of a bicycle are doubled in size (the cranks remaining the same), will it require less power to propel the wheel? A. Slightly better results may be looked for from sprockets of large diameter.

(6976) F. J. M. says: 1. What does a Chinese laundryman use for his shirts, collars, and cuffs to bring forth an elegant gloss? A. Laundrying of shirts. (Chinese method.) A rather thick starch paste is prepared by first beating up a handful of raw starch, usually corn starch, and a teaspoonful of fine rice flour with about a quart of water, making a liquid of creamlike consistence. A certain quantity (determined alone by personal experience) is poured into a quantity of boiling water, while the latter is violently stirred with a short wooden spatula. With this the portions of the linen to be dressed are well smeared, the linen moist from wringing and the starch quite hot. Thus smeared the pieces are laid aside for a few minutes, then rubbed well between the hands, so that the paste is well distributed in the fabric. The linen is then usually dried by artificial heat. When ready for ironing, the starched portions are dampened by means of a cloth dipped in raw starch water to which has been added a small quantity – about ½ ounce to the quart of blood albumen—clarified serum of bullock's blood. The proportion of starch in this water is usually about as 1 to 50 of water. In ironing, the irons are first made very hot, and cooled somewhat externally just before using by momentarily plunging them into a pail of water. The irons commonly employed are what are termed polishing irons; they have the posterior edge rounded instead of angular, as in the ordinary smoothing or sadiron. Much of the fine gloss observed on shirts laundried by Chinamen is accomplished by the skillful manipulation of this "rounded edge" over the work—a manipulation very difficult to describe in words. It is most laborious work for those not accustomed to it. It not only renders the surface glossy, but imparts easy flexibility to the heavily starched fabric otherwise not attainable. Custom made shirts are usually laundried before delivery in trade at the factory, the ironing in these cases being largely performed by steam mangles, though some are hand finished. The following receipt for a laundry starch is said to produce a very fine and lasting gloss on linen without the expenditure of the amount of labor in ironing usually requisite to produce a fair appearance:

Corn starch	1 oz.
Water, boiling	1⅞ pt.
Bluing	q. s.

To this when it has cooled somewhat is added and thoroughly mixed in about half an ounce of the following preparation:

Gum arabic	8¾ parts.
Sugar, loaf	2½ "
Soap, white curd	¼ "
Waterglass ("A" sirup)	1 "
Egg albumen	4 "
Water, warm	20 "

In preparing this the first three ingredients are dissolved together in the water at boiling heat, the waterglass is then added, and when the mixture has cooled down to about 150° Fah., the egg albumen is put in and the whole well beaten together. 2. How can I remove letters or numbers from linen which are written with indelible ink? A. Indelible ink stains are difficult to remove. Try using a saturated solution of mercuric chloride. The mercury salt is poisonous. 3. Will you please give me a receipt how to make universal cleaner that will take out stains, be said stains either blood, beer, wine, or fruit or any other kind, and without regard as to the materials, be the latter either silk, linen, carpets, or kid leather or any other product? A. There is no universal cleaner.

(6977) C. A. H. says: Will you kindly publish a formula for making a liquid shampoo, such as the barbers have for the hair, one that will make plenty of foam, by rubbing, but the foam should gradually disappear again, called a dry shampoo? And must I use distilled or common water? A. Liquid shampoo:

Sesquicarbonate of ammonia	2 drm.
Carbonate of potash	2 "
Soft water	¼ pt.

Dissolve and add the solution to a mixture of—

Tincture of cantharides	1½ fl. oz.
Rectified spirit	¼ pt.
Good rum	1½ "

And agitate the whole well together, adding a little scent or not, at will. This preparation, too, has been highly recommended for removing dandruff, preventing the hair falling off, etc. In using it, the hair is wetted with it, well rubbed so as to form a lather, and then either washed with cold or lukewarm water, or rubbed dry with a towel and at once arranged with a brush and comb. A commoner kind, in which the rectified spirit and one-third of the rum is replaced by water, forms the shampoo liquid often used by the hairdressers after cutting the hair. It is not necessary to use distilled water.

(6978) I. B. A. says: I have been trying to make rubber cement with the following solvents, o wit: Chloroform (Merck's purissima), benzole (pure), and also with carbon bisulphide. With chloroform, the rubber swelled very much and then floated on top of the liquid in the shape of flocculent matter, but would not dissolve. With benzole, the rubber swelled also very much, becoming transparent, with a fine amber color, but I could not get it to dissolve. The same thing happened with the carbon bisulphide. The rubber used was the pure gum of Para. Can you tell me what was the matter and how I can succeed in making a rubber cement with either of these ingredients? With each of the solvents I tried heat, but without success. A. You will have difficulty in making a good rubber cement if you do not have the requisite facilities for digesting the pure unvulcanized rubber under pressure. We recommend you to use benzole. Allow the gum to swell, then rub in a mortar, adding more of the solvent. It will not make a true solution, but will remain a pasty mass.

TO INVENTORS.

An experience of nearly fifty years, and the preparation of more than one hundred thousand applications for patents at home and abroad, enable us to understand the laws and practice on both continents, and to possess unequaled facilities for procuring patents everywhere. A synopsis of the patent laws of the United States and all foreign countries may be had on application, and persons contemplating the securing of patents, either at home or abroad, are invited to write to this office for prices, which are low, in accordance with the times and our extensive facilities for conducting the business. Address MUNN & CO., office SCIENTIFIC AMERICAN, 361 Broadway, New York.

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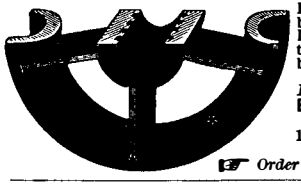

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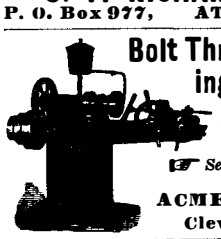

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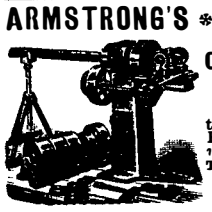

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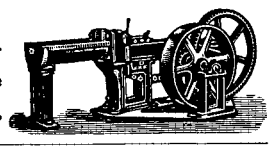

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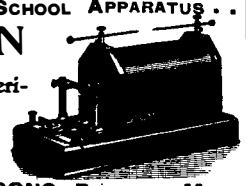

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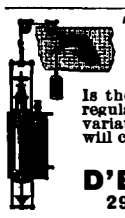

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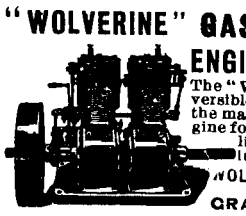

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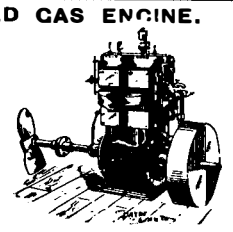

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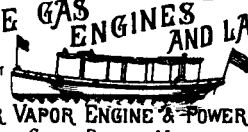

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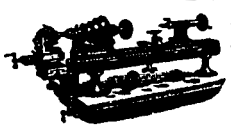

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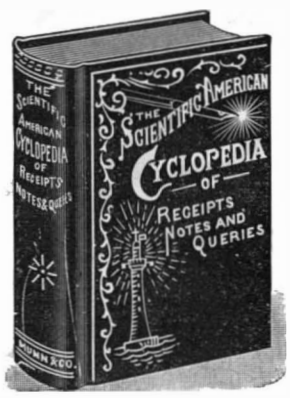

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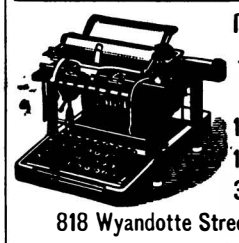

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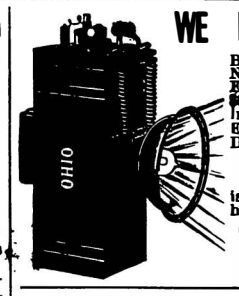

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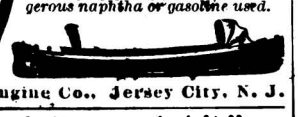

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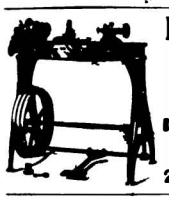

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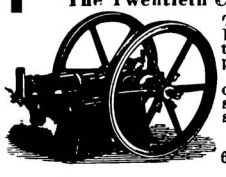

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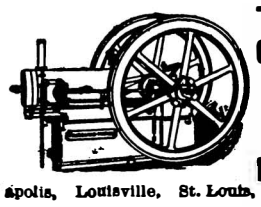

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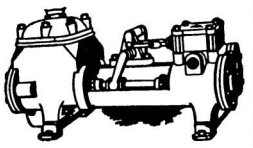

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